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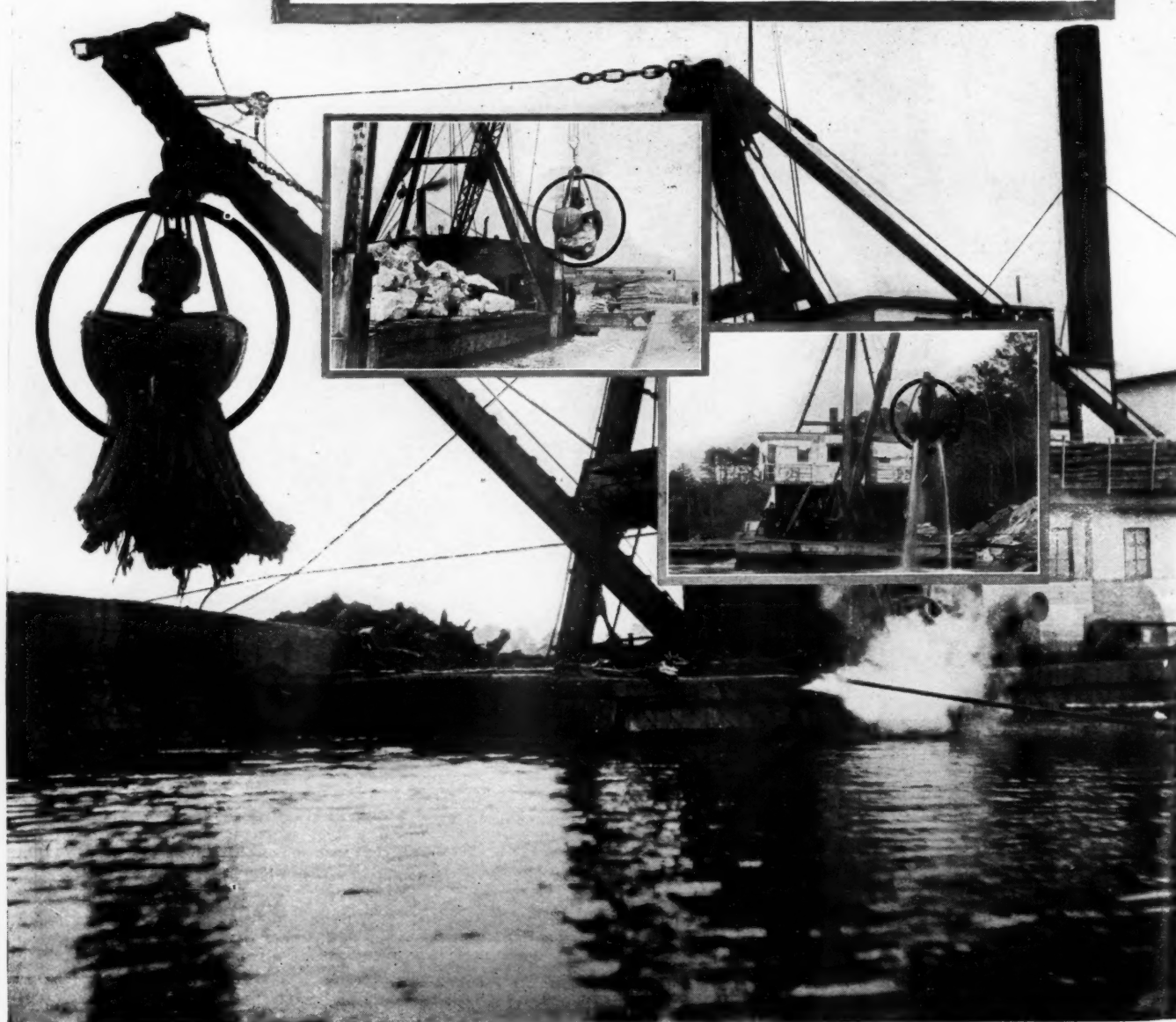
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# PUBLIC WORKS.

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A Combination of "MUNICIPAL JOURNAL" and "CONTRACTING"

Vol. 49

FLORAL PARK, OCTOBER 2, 1920

No. 14

## Earth Moving Machinery in Bronx Parkway

Drag-line excavators, steam shovels, tractors and trailers, dump cars, derrick trucks, mobile derricks, motor trucks, dump wagons, scrapers and other appliances used for excavating and moving several hundred thousand cubic yards of material. Cost records kept and unit costs calculated.

Bronx Parkway is a long, narrow park now under construction between the northern part of New York City and Kensico reservoir in Valhalla, a total length of about 16 miles. The parkway follows the Bronx river, including a narrow strip along each side of the river, the width of the parkway varying from 200 to 1,320 feet. Along a large part of its length it abuts on one side against a railroad embankment and on the other side against a highway. After several years of preparation, actual construction had just gotten well started when the war interfered. Active work was renewed last year, and is now well under way

and will probably be continued to completion.

From a money point of view and that of the amount of work involved, earth moving is by far the most important feature of the development of the plans of this parkway, which call for the movement of earth in making excavation and embankment to a total amount of several hundred thousand cubic yards, there being 215,000 cubic yards in the section which is now under active construction. In view of the large amount of earth to be handled and of the labor situation as it was last year and as it still remains to a certain extent in this section, there can be no doubt



SMALL DRAG-LINE EXCAVATING RIVER CHANNEL; STEAM SHOVEL HANDLING SECOND TIME



of the wisdom of the Bronx Park Commission in deciding to use machinery to as large an extent as practicable and thus reduce to a minimum the amount of day labor required. The carrying out of this decision was aided by the fact that the commission was able to obtain part of the needed equipment from the army by purchase or in the form of equipment loaned to the State of New York for highway construction purposes.

#### MACHINERY USED ON THE WORK

The larger pieces of apparatus now being operated by the commission are as follows:

1 Monighan drag-line excavator with 2-yard bucket and 60-foot boom.

1 Monighan drag-line excavator with 1-yard bucket and 40-foot boom.

4 Bucyrus steam shovels, 3 being size 18B and 1 size 14B.

1 Lombard tractor.

2 Holt tractors.

5 Watson bottom-dump trailers of 2 yards capacity.

10 Western bottom-dump trailers of 2 yards capacity.

10 Buffalo-Pitts trailers of 4 yards capacity.

12 Koppel cars, with light construction track.

1 Winther derrick truck.

1 Austin excavator.

2 3-ton Packard trucks.

6 5-ton Hurlburt trucks.

2 1-ton Aviation trucks.

2 Ford runabouts, 2 Ford touring cars and 2 Ford ambulances.

There have been ordered and are now on the way 2 Bucyrus "Universal" shovels, type 30B, and also 2 Bucyrus mobile derricks. Fifteen to twenty teams and wagons are hired at \$10 a day for use on the lower section, where is located most of the excavation now under way, and about five additional ones at other points where bridge construction and other small items of work are under way.

The drag-line progresses by a walking attachment, a cam on each end of a shaft through the center of gravity of the machine, and provided

with a long shoe which takes bearing upon the ground, permitting the operator to lift the entire appliance, including the turn-table on which it revolves, swing it forward about three feet, and lower it to a new position on the surface.

The tractors and steam shovels are all provided with caterpillar traction. The caterpillar traction was necessary on this work because a very large part of it is in low land along the banks of the Bronx river, and much of it is wet and even swampy.

In addition to the above, there is the necessary amount of small appliances such as drag scrapers, wheelbarrows, shovels and other hand tools, small hand and power pumps, and the like. The commission maintains a machine shop where practically all repairs are performed and some of the simpler appliances are constructed.

All of the work is under the immediate charge of Gilmore D. Clarke, superintendent of construction. The chief engineer is Jay Downer, and L. G. Holleran is deputy chief engineer.

Very soon after he took charge of the work last October, Mr. Clarke revised and extended the method of cost keeping. At the present time the accounts are kept so as to give the cost of the work done by each machine and also the cost per cubic yard of handling earth, including all machinery and labor employed. An illustration of these records will be given further on in this article.

#### NATURE OF THE WORK

The Bronx river-wound with a very circuitous course through a valley bottom that was in general very flat and a few hundred feet wide, with a railroad bank along one side and a highway along the other. The greater part of the low banks were more or less swampy and covered with grass, weeds, cat-tails, etc.

The plans made for the parkway called for the straightening of many of the bends of the river, the forming of pools or lakes here and there and the shifting of the channel wherever it ran close to the foot of either the railroad or highway embankment, in order to permit the planting along



LARGE DRAGLINE DIGGING NEW CHANNEL AND FILLING OLD



these embankments of trees and shrubbery which would serve to screen them and the traffic carried over them from the view of those in the parkway. A driveway 40 feet wide is carried continuously from one end to the other of the parkway, sometimes on one side of the river and sometimes on the other, as the location of the river channel requires. This, of course, necessitates a number of bridges across the river. These are being built of concrete, either arch or slab-and-beam construction, but in each case faced with stone in order to present an appearance more appropriate for the surroundings.

In addition to the moving of the channel of the river and grading of the roadway, the low spots are all being raised, connections between the driveway and several of the highways crossing above the parkway (which lies below the adjacent country on both sides) are being made by filling in, and numerous small structures are being con-



STEAM SHOVEL FILLING HORSE-DRAWN WAGON:  
GRADING DOWN HIGH LAND

to be covered with one foot of top soil. (It has been found by experience in New York City that two feet of earth and one foot of top soil on a cinder fill will permit the growth of trees as well as of shrubs and smaller vegetation.)

#### METHOD OF OPERATION

In moving the river channel it is, of course, necessary to provide a new channel at each point before the old channel is filled in. Also it is necessary to study carefully the most economical method of handling the dirt excavated in the making of the desired fills so as to reduce the haul to a minimum and perform all handling by the appliances most economical for that particular service.

The appliances used for original excavating of the earth are the drag-line and the steam shovel. Transportation of the earth is performed by means of horse-drawn trucks, tractors and trailers, motor trucks, dump cars on portable track and drag scrapers. The drag scrapers are used almost exclusively for leveling off the dirt dumped by trucks. Koppel dump cars were used at first, but a large part of the material excavated is so wet and sticky that it was found that it would not slide out of the cars when dumped; although it would, of course, drop out of a truck with bottom dump and practically vertical sides. Consequently the dump cars are not now being used, although they may be used again if suitable material is encountered. The motor trucks are used, very little, if at all, for hauling excavated material, but their duties are rather confined to the hauling of broken stone, drain tile and other materials used on the work.

Most of the hauling of excavated material is being done by dump wagons used as trailers behind tractors with caterpillar traction. Four-yard trailers were used at first in trains of three, but in the soft ground it was found that these sunk in too deep and some were practically pulled to pieces by the tractors when trying to draw them through the wet bottom land. (The river, although a small stream, is subject to frequent and very considerable freshets which cover the bottom land and keep it soft, in addition to making work impossible for a day or two at a time.) Two-yard wagons are now being used as trailers, five to a train. The amount of dirt hauled by these tractors and trailers, of course, depends upon the



STEAM SHOVEL USED FOR BUILDING RETAINING  
WALL

structed, such as culverts, drains for carrying off the surface water, etc. In order to prevent seepage under the roadway of underground water from the hills, a drain is being built along the edge of the roadway furthest from the river for intercepting the underground flow, this consisting of a line of circular drain pipe 4 inches to 8 inches in diameter laid at the bottom of a trench about 2 feet deep and surrounded and covered to a depth of 6 inches with broken stone, concrete size; this in turn being covered with field stone up to 6 or 8 inches diameter placed by hand and carried up to the top of the subgrade and there covered with sod turned upside down on which is placed the top-soil covering. These drains have outlets into the river at all low points.

In the section now under construction it was found that the excavation would supply about 100,000 cubic yards less material than was needed for embankment, and this amount of cinders was contracted for and is being supplied from local factories. This and the paving of the roadway are the only parts of the work which are being done by contract, all the rest being done by the Park Commission under its own superintendents.

The cinders are to be covered with two feet of dirt, and this and all new ground in the park is



DERRICK TRUCK FITTED WITH CRANE AND CLAM-SHELL BUCKET

length of haul, and this varies anywhere from 200 or 300 feet to 1,500. For short hauls, the two tractors and ten trailers will easily handle 500 cubic yards a day. At one place where the length of haul was 1,500 feet, the average amount hauled was about 350 cubic yards. At some points where there is not sufficient width of fill to permit the tractors to turn around, it is necessary to use horse-drawn wagons, which can turn in a much narrower space.

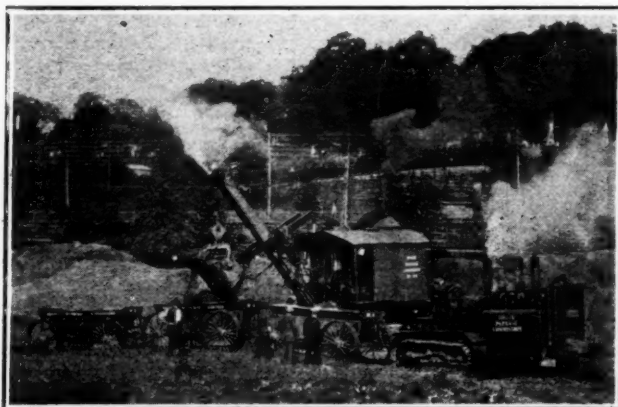
It was found that the original excavating of most of the material could be done much more cheaply with the drag-line than with the steam shovel. In partial explanation, at least, of this, it is to be remembered that the greater part of the excavating is being done below the level of the machine and frequently from the bottom of the river, while the material is being disposed of at a higher level. Because of the greater efficiency of the drag-line for such work, this machine is being used exclusively for the first excavating of such material. Where the excavated material is to be deposited along the banks immediately opposite the point from which it was removed, no more rehandling is necessary except for a general leveling off and grading of the embankment. Where the excavated material is to be moved across the valley more than 75 to 100 feet, a second and sometimes a third movement of the material is effected by the drag-line. It is found that moving three times by the drag-line costs less than excavating by the drag-line, depositing in trailers and carrying by tractor to the desired point. Where the material excavated is to be moved lengthwise of the valley, however, the drag-line cannot effectively complete the handling of the material.

The general method of operating the drag-line is to place it near the bank of the river or the line selected for the bank of the new channel, remove first all the top soil and deposit it in a bank along the edge of the channel; then, when all the top soil that can be reached from this position has been removed and deposited, the soil beneath is removed and deposited back of this embankment. This bottom soil, which is frequently the muck from the bottom of the river, is thus prevented by the embankment of top soil from flowing back to the channel. In all cases the top soil is kept separate from the rest of the excavation and is

used later for giving a 12-inch covering to all new embankment.

As soon as all of the material that can be reached by the drag-line from a given position, down to the desired depth, has been removed and deposited at one side of and behind the drag-line, the machine then moves by its walking equipment to a new position a few feet up or down stream and repeats the process.

The larger drag-line with the 2-yard bucket, when timed by the writer, excavated a bucket full for each 40 to 50 seconds, averaging 45 seconds per bucket. It is found that the buckets are nearly always filled to their full capacity, but about 10 per cent is allowed for shrinkage, due to settlement, draining out of water, etc. Both of the drag-lines are worked sixteen hours a day in two shifts, from 6 in the morning till 2 in the afternoon and from 2 until 10. The larger drag-line has a 90 h. p. engine burning kerosene and the smaller drag-line has a 3-cylinder gasoline



THREE TRAILERS DRAWN BY HOLT TRACTOR

engine. These drag-lines together average about 900 to 1,000 yards in each 8-hour shift, or 1,800 to 2,000 yards a day. When it was attempted to have the drag-line deposit the excavated material directly into carts or dump cars, the amount of work done was very much reduced because of the delays in waiting for cars, shifting them into position, etc. It is found to be cheaper in the long run, where the material has to be handled by trailers, to use a steam shovel for loading on to the trailers material which has previously been excavated by the drag-line. The steam shovels also are used for excavating the higher land, where the dirt to be removed lies above the contemplated grade.

The drag-lines were assembled and set up by the commission on the site, and the only practicable method of moving them from point to point along the work appears to be by walking them under their own power, although such progress is naturally very slow. The larger machine weighs about eighty tons and, assuming that a truck could be obtained stout enough to carry it, many of the bridges on the line of the roads could not safely carry such a load.

In operating the two drag-lines and the four steam shovels, eight operators are employed. In addition to these, there are altogether 230 em-



ployees, half of them day laborers and the other half drivers, chauffeurs, foremen, mechanics, etc. The greater part of the day labor is used in building drains, bridges, culverts and other small structures and in doing the final grading of the embankments. In the main dirt handling, practically the only labor employed comprises the eight drag-line and shovel operators, the two tractor operators, two or three men and horses with drag-scrapers spreading the material dumped by the trailers, and six or eight more as helpers around the various pieces of apparatus.

#### COST RECORDS

The operator of each of the large machines sends in a weekly report of the operation of his machine, the week extending from Thursday to Wednesday, both inclusive. The weekly report gives the date, section number, machine number, name and type of machine, time of shift, and type of vehicle loaded, if any. The vertical columns have headings as follows: "Hours engaged" ("from"-to). "Time used in moving." "Time used for repairs or shut-downs." "Nature of repairs or shut-downs." Under the main heading, "Number of buckets excavated," are the seven sub-headings: "General," "River," "Lake," "Top soil," "Second handling," "Third handling," and "Loading." Under the general heading, "Helper," are the two column headings, "Time" and "Rate."

These data are entered on a special sheet devoted to the machine in question. The summaries are also recorded on another sheet giving the amount of work done and unit costs for each of the several pieces of apparatus on the particular section of the work to which this sheet applies. Each machine has a separate record, the headings on which are as follows: "Date," "Operators," "Helpers," "Watchmen," "Fuel," "Oil and grease," "Miscellaneous supplies," "Depreciation," "Repairs" ("Labor"- "Material"), "Cost of excava-

tion," "Cubic yards excavated," "Unit cost," and "Remarks." The cost of each of these items is given for each day, and at the bottom of the sheet is given the total for the month. In addition there is given at the bottom the total for the entire period since the machine went into service, and from this is calculated the unit cost averaged for the entire period of service of the machine. These total costs include depreciation, costs of watchmen, and all other costs connected with the machine during winter and other idle periods as well as during the season of operation, so that the unit cost averaged to date provides for all expenditures and overhead charges for the machine up to that time.

#### ACTUAL COST FIGURES

As an illustration of the costs, the following figures are given from the records:

For the smaller Monighan drag-line, during the month of August the charges were as follows: Operators, \$465.79; helpers, \$422.25; watchmen, \$31; fuel, \$361.95; oil and grease, \$35.53; miscellaneous supplies, \$15.80; depreciation, \$184; repairs, \$16.88 for labor, \$26 for materials. This gives a total cost of \$1,559.20. 11,075 cubic yards were excavated, giving a unit cost of fourteen cents per cubic yard. For the same machine, the totals up to the end of August included \$2,024 for depreciation, \$1,833.90 for labor in making repairs and \$1,874.89 for materials. Up to that time the machine had excavated 68,595 cubic yards and the unit cost, averaging the entire period, had been 21.8 cents per cubic yard. In this calculation the depreciation is based on an assumption of a life of four years working 250 days a year, or 1,000 days of work.

The above includes considerable work which was done under unfavorable conditions. Taking only one year, that of 1919, the unit costs figure out as follows: Labor of all kinds, 8.05 cents per



FIVE TRAILERS DRAWN BY LOMBARD TRACTOR



cubic yard; gasoline, 2.86; lubricating oil, 0.50 cents; miscellaneous supplies, 1.71 cents; depreciation, 3.375; giving a total average cost of excavation of 16.5 cents a cubic yard.

The larger Monighan machine began work on May 12 of this year and up to the end of July the totals had been as follows: Operators, \$925.68; helpers, \$1,233.13; watchmen, \$249.50; fuel, \$1,324.89; oil and grease, \$310.15; miscellaneous supplies, \$1,223.83; depreciation, \$2,003.18 repairs, \$158.39 for labor and \$114.12 for material; total cost of excavation, \$7,542.87; cubic yards excavated 55,162, giving a unit cost of 13.6 cents per cubic yard.

One of the steam shovels for the month of June gave the following cost: Operator, \$200; helpers, \$140; watchmen, \$60; fuel, \$216.66; oil and grease, \$45.95; miscellaneous supplies, \$3.36; depreciation, \$184; repairs, nothing; total cost of excavation, \$849.97. 11,477 cubic yards were excavated, of which 1,716 was second handling, 1,590 was third handling, and 4,095 was top soil. This gave an average cost of 7.4 cents per cubic yard, but this average includes no allowance for cost while lying idle during the winter or for repairs. This machine has excavated 20,803 cubic yards to date and the totals are recorded as \$1,198.38 for operators; \$1,020.75 for helpers; \$1,133 for watch-

men; \$1,814 for fuel; \$123.60 for oil and grease; \$218.72 for miscellaneous supplies; \$1,420.54 for depreciation; \$358.75 for labor and \$180.36 for materials for repairs; giving a total cost of \$7,468.09. From this should be deducted \$1,885, the cost during three months when the machine was engaged in building retaining walls. For the five months of excavating and idleness covered, the record gives an average cost of 26.8 cents per cubic yard, showing the considerable difference between an average that allows for all overhead and a figure applying to only one favorable month. It is apparent that these averages of long periods which include the idle winter season are the correct ones for determining the actual cost of the work.

The records for the total cost of handling earth in the section now under construction for the month of July, 1920 (with no allowance for winter maintenance), obtained by dividing the total operating cost of each machine employed by the total amount of earth handled, show that the cost of drag-line excavating that month was 9.1 cents per cubic yard; steam shoveling, 14.7 cents; tractors and teams, 22.6 cents; spreading on the dump, 11.2 cents; giving a total cost per cubic yard handled (a considerable amount of it two and even three times) of 57.4 cents per cubic yard.

## The Labor Situation

General development since 1915; present conditions and requirements; definite policies; supply, strikes and wages

A review of the present labor conditions and prospects in the United States is inseparable from consideration of the conditions existing before the entrance of this country into the world war and the unprecedented changes that have taken place in direct and indirect consequence thereof.

Previous to 1914, labor conditions in the construction field, to which this article is strictly limited, were substantially uniform and regular in most parts of the country. Labor was abundant. The standards of hours and wages were fairly well proportioned to intrinsic values, and were generally accepted by employers and employees. Efficiency and reliability were normal and the occasional strikes and lock-outs were of local character and generally subject to reasonable settlements.

There was no general serious surplus or shortage of labor or employment and in most of the large cities notices that extra help was required would bring abundant applications promptly to the job. Where a large construction force had to be quickly secured for remote districts, advertisements, application to foremen and skilled laborers, or commissions to padrones or employment agencies procured men readily at current prices.

Contractors could estimate with considerable accuracy the cost and efficiency of labor and could depend on securing it at prevailing rates, or at a slight increase under special conditions, and were, therefore, able to make safe bids for important or long-continued work at reasonable prices, the situation then being a familiar one resulting from the gradual growth and development of years.

### EFFECTS OF THE WAR

For many years the increasing tendency of this country has been for native Americans to work principally at skilled labor or in commercial or executive positions, leaving a large amount of common and especially heavy labor and much of the mechanical and trade work to be done by labor of foreign birth or parentage. In other words, the resident supply of common and a considerable proportion of skilled labor was becoming more and more inadequate and greater and greater dependence was placed on immigrants, the rapidly increasing annual supply of which had attained a maximum of 1,218,480 in 1914, which was probably equivalent to 850,000 working men and boys.

At the beginning of the war, immigration was

violently arrested by the absorption into their armies and civil occupations, of the total manpower of the belligerent countries that had previously been the principal sources of immigration to the United States. In 1915, the total immigration dropped to 326,700 and in 1918 to 110,618; minimums which, when further reduced by the greatly increased number of aliens (most of them working men) who left this country to join the armies of their Fatherlands, entirely eliminated the foreign labor supply and caused a deficiency of more than 1,000,000 men a year below normal.

This quickly altered economic conditions so that men were difficult to obtain in large quantities and wages advanced considerably, impelling many farsighted contractors to give serious attention to developing their organizations and efficiency and to the increased use of labor-saving methods and appliances. It was still possible to secure, at a price, men for construction work, but the work had to be planned with due regard to the impaired quality and amount of labor available.

The increased exports of war materials and other supplies also helped to increase the demand, and with it the wages, for labor, but conditions did not become very serious until after the United States entered the war in April, 1917, and the national resources were applied to the utmost in military directions. Besides 2,000,000 men drafted into the army and navy, an enormous number of men were required to fill the new positions produced by the increased export business and by the tremendous Federal construction operations and war work on ammunition, supplies, etc. These demands absorbed all the ordinary labor supply and extended to great numbers of women, girls, boys and old men not previously engaged in such pursuits, leaving barely enough men to carry on indispensable operations, after a large amount of work, including general and engineering construction and most public works and improvements, had been specifically prohibited as non-essential by the Federal Government.

Labor was accordingly scarce and exceedingly dear. The government policy of executing more than \$1,000,000,000 worth of emergency construction with selected contractors operating on cost-plus basis, together with its avowed intention to increase wages to correspond with increased general costs and a frantic disposition to yield to all of labor's demands and satisfy its wishes regardless of consequences, inevitably produced an artificial condition, making labor a favored class. This condition was quickly realized and exploited to a high degree, with the result that wages doubled and trebled and labor made exorbitant demands and became more and more arrogant. Labor hours were shortened, heavy overtime rates were established and great numbers of unskilled employees were rated as skilled employees, seriously reducing the quality and output of work.

These conditions necessarily produced idleness and extravagance; many men worked only part time and their efficiency was greatly decreased, while costs multiplied.

At the close of the war the requirements disappeared with the emergency, but union leaders

still insist that there shall be no diminution of employment or reduction of wages, and the result has been unexampled labor unrest and unreliability, the multiplication of strikes and an endless increase of wages that has scarcely yet reached its maximum. Altogether the result has been a general increase of more than 100 per cent in wages, and a decrease of at least 50 per cent in efficiency, making unit costs for construction work, exclusive of materials, often four times or more as great as formerly. This and the plague of unjustified strikes and the violation of contracts by labor organizations has made it impossible for contractors to estimate safely on labor costs and they have been compelled to refuse to bid, or to bid only on a cost-plus basis, for important or long-continued work.

This and high material prices have resulted in postponing a large amount of work, including \$2,000,000,000 or \$3,000,000,000 worth of deferred construction due to war conditions, all of which is ready for resumption under more favorable and safer conditions.

At present, the supply and demand for labor are fairly well balanced, but in order to regain normal or well-proportioned prices and wages, or to undertake the vast amount of new and accumulated construction, great quantities of additional labor, especially unskilled workmen variously estimated at 1,000,000 to 3,000,000, are urgently needed.

A large part of these men are available by immigration. The number of aliens entering this country has begun to increase very rapidly during the present year and is now limited only by the available transportation. Although some foreign countries will doubtless endeavor to restrict emigration, the supply will doubtless be adequate if this country permits and encourages immigration. The great necessity is for an abundance of unskilled labor, which can be secured not only from Europe, but also from Asia, Mexico, Porto Rico and other countries and should be admitted with proper restrictions.

It may perhaps be advisable to discriminate between permanent immigrants who should become citizens, and temporary immigrants for whom the illiteracy test might be waived. In all cases, political opposition should be removed and efficient provision made for excluding radicals and criminals, and for the thorough Americanization of all who are admitted as permanent immigrants.

There should also be proper legislation to incorporate labor organizations and make them responsible, and to enforce the execution of contracts between employer and employee and prevent violence, intimidation and conspiracy in labor controversies. Given such conditions, there should be no difficulty in securing abundance of labor at a fair price for all kinds of construction work.

#### WAGES

In October, 1915, the standard rates for skilled and unskilled labor in Greater New York were listed as:

Blacksmith, \$3.68 to \$4.00; blacksmith helper, \$2.00 to \$2.25; blaster, \$4.50; bricklayer, \$6.00; caulker, \$4.50; cranesman, \$125 per month; dock builder, \$4.00; drill runner, \$3.68; drill helper, \$1.75 to \$2.00; electrician, \$4.80;



electrician helper, \$2.00 to \$2.50; engineer, compressor plant, \$125 per month; engineer, hoisting, \$4.25; engineer, locomotive, \$125 per month; engineer, shovel, \$150 to \$175 per month; fireman, \$60 to \$80 per month; hoister runner, \$4.25; hoister on steel, \$5.50; iron erector, \$5.00; iron helper, \$3.00; laborer, common, \$1.60 to \$1.75; laborer, concrete, \$1.75 to \$2.25; laborer, handy, \$2.25 to \$3.00; laborer, rigging, \$2.00 to \$2.80; machinists, \$3.00 to \$3.50; mason, stone, \$4.80; painter, iron, \$2.25 to \$2.50; pipemen, \$2.00 to \$2.25; pipe fitter, \$3.00 to \$3.50; pitmen, \$2.50; pumpmen, \$2.00 to \$2.25; rigger, boss, \$4.80; riveter, \$5.00; rockman, \$2.25; shorer, \$3.68; shorer helper, \$2.65; signalmen, \$1.75 to \$2.00; stablemen, \$2.00; stonecutter, \$4.50 to \$5.00; timbermen, \$2.25 to \$3.00; timbermen helper, \$1.75 to \$2.00; waterproofer, \$4.25.

On April 22, 1920, the executive committee of the Board of Governors of the Building Trades Employers' Association, New York, in conference with the representatives of the Building Trades Council, agreed to a schedule of wages allowing an increase of \$1 per day after May 1, 1920. The new scale, based on an eight-hour day, now in effect, is:

Art glass workers, \$8.00; asbestos workers and insulators, \$9.00; bluestone cutters, \$9.00; bricklayers, \$10.00; carpenters, \$9.00; dockbuilders, house shorers and sheathpilers, \$9.00; cement and concrete workers (laborers) \$6.50; composition roofers and waterproofer, \$8.00; composition roofers and waterproofer (foremen), \$8.50; electrical workers, \$9.00; electrical workers' helpers, \$5.50; elevator constructors, \$9.00; elevator constructors' helpers, \$7.00; hoisting engineers, by the week, \$52.25; hoisting engineers, by the day, \$10.00; hoisting engineers, running compressors, extra per week, \$7.00; housesmiths and bridge-men, local No. 40, \$9.00; housesmiths' finishers, Local No. 52, \$9.00; housesmiths' helpers, \$7.00; marble cutters and setters, \$9.00; marble carvers, \$10.00; marble polishers, bed rubbers and sawyers, \$8.50; marble cutters' helpers, riggers, crane and derrick men, \$7.00; mosaic and terrazzo workers, \$8.00; mosaic and terrazzo workers' helpers, \$6.50; metallic lathers, \$9.00; plasterers, \$9.50; plasterers' laborers, \$7.00; plumbers and gasfitters, \$9.00; roofers and sheet metal workers, \$9.00; riggers and machinery movers, \$9.00; steam and hot water fitters, \$9.00; steam and hot water fitters' helpers, \$7.00; stone derrickmen, \$8.00; tile layers, \$9.00; tile layers' helpers, \$7.00; wood lathers, \$9.00.

Common labor not included in the above scale is paid from \$5.20 to \$6.00 per day.

Information concerning conditions in their vicinities was furnished at our request by eleven contractors located in New York, Pennsylvania, Ohio, Iowa, Wisconsin, Oklahoma, Michigan and North Dakota; these contractors making a specialty, respectively, of street paving, highway construction, water works and sewer construction, tunnels, buildings, and general contracting. These reported that since last spring wages in their several localities had increased from a minimum of 10 per cent in one case to a maximum of 85 per cent in another (the latter being in Milwaukee), with an average of 31 per cent. The wages paid common labor were reported as 50 to 65 cents an hour, 55 to 60 cents, 55 cents, 61 cents, 65 cents, 65 to 70 cents, and 90 cents in two cases, \$5 a day in one case, \$5.50 in another and \$6 in a third. Replying to the question whether labor was more plentiful than last spring, six answered yes, four no, and one that it was unchanged. However, nine of the eleven believed that it would be more abundant in 1921, one was in doubt, and one believed that it would not be.

## A Clearing House for Labor

**Employment secured for labor, help secured for employers, and surplus labor shifted in and between 18 zones by a Federal bureau.**

In February, 1915, the scope of the activities of the Division of Information of the Bureau of Immigration, United States Department of Labor, was enlarged to cover employment. The United States was divided geographically into 18 zones, some of which were sub-divided, each division or sub-division being in charge of an immigration inspector to receive applications from employers and those in search of employment with a view of filling both wants. In the first six months, up to August, 1916, the division received 94,482 applicants for positions and filled 16,974 positions. During the month of July, 1915, the total number of applications received for help was 1,160, number of persons applied for 8,665, number of applications for employment 18,061, number referred to employment 6,360, number actually employed 6,035. The classification by zones was as follows:

- No. 1—Boston, Mass.
- No. 2—New York, N. Y., Buffalo (sub-branch), N. Y.
- No. 3—Philadelphia, Pa., Pittsburgh (sub-branch), Pa.
- No. 4—Baltimore, Md.
- No. 5—Norfolk, Va.
- No. 6—Jacksonville, Fla.; Charleston (sub-branch), S. C.; Savannah (sub-branch), Ga.; Birmingham (sub-branch), Ala.; Mobile (sub-branch), Ala.
- No. 7—New Orleans, La. (sub-branches).
- No. 8—Galveston, Tex.; El Paso, Tex.; Albuquerque, N. M.
- No. 9—Cleveland, Ohio.
- No. 10—Chicago, Ill.; Detroit (sub-branch), Mich.; Indianapolis, Ind.; Sault Ste. Marie, Mich.
- No. 11—Minneapolis, Minn.
- No. 12—St. Louis, Mo.; Kansas City (sub-branch), Mo.
- No. 13—Denver, Col.; Salt Lake City (sub-branch), Utah.
- No. 14—Helena, Mont; Moscow (sub-branch), Mont.
- No. 15—Seattle, Wash.; Aberdeen, Wash.; Bellingham, Wash.; Colfax, Wash.; Everett, Wash.; North Yakima, Wash.; Spokane, Wash.; Sumner, Wash.; Tacoma (sub-branch), Wash.; Walla Walla (sub-branch), Wash.
- No. 16—Portland, Ore.
- No. 17—San Francisco, Cal.; Sacramento, Cal.; Fresno, Cal.; Eureka, Cal.
- No. 18—Los Angeles, Cal.; San Diego, Cal.; Tucson, Ariz.

After the entry of the United States into the war, the activities of this division were extended



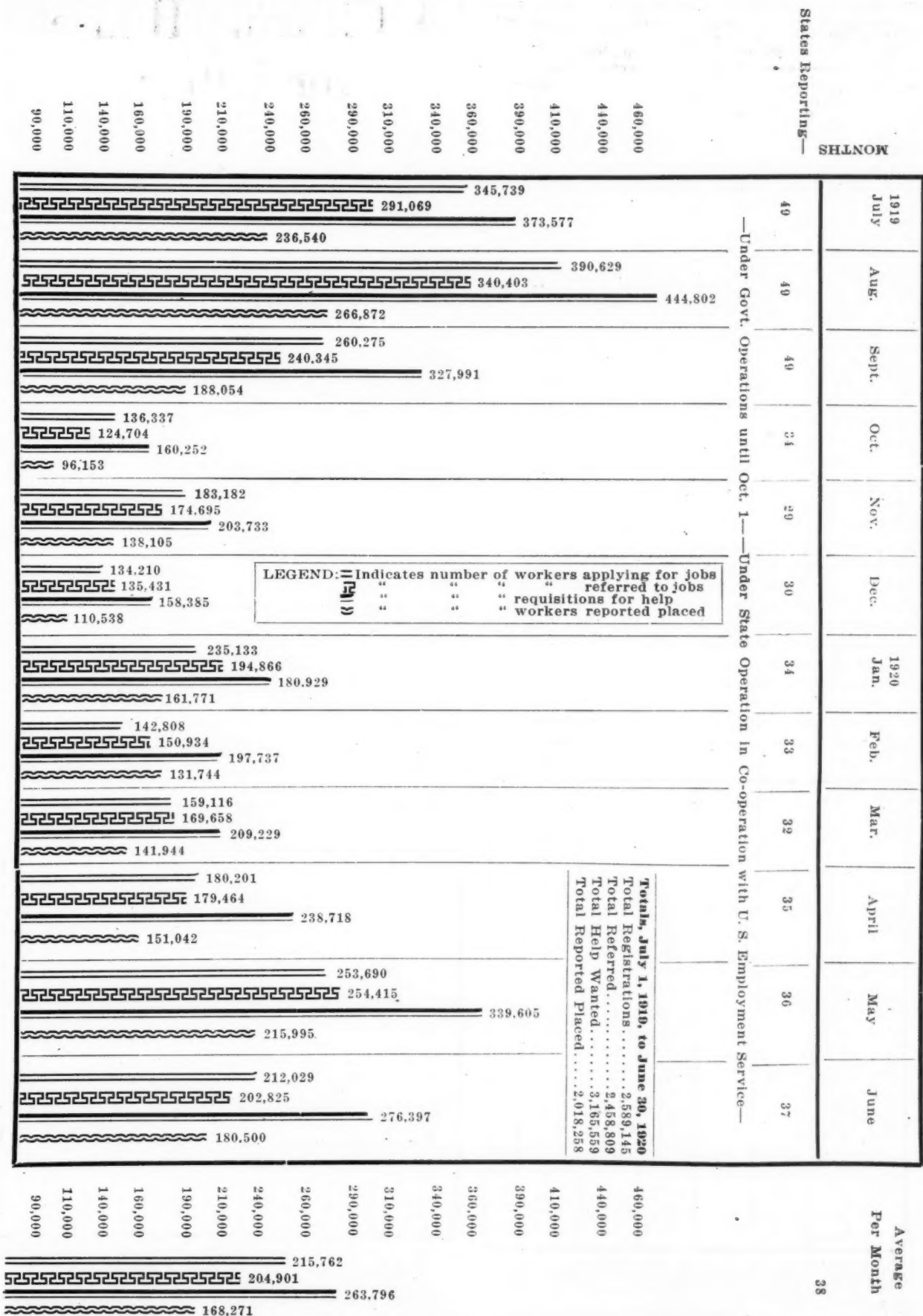


CHART SHOWING RELATIONS BETWEEN REGISTRATIONS, REFERRED, HELP WANTED, AND PLACED, BY MONTHS, FOR THE YEAR JULY 1919—JUNE 1920.

and employment was secured for a very much larger number. In the year ending July, 1920, there were received 2,589,145 registrations, of which 2,458,809 were referred to prospective employment. There were also received 3,165,559 requests for help wanted and there were placed 2,018,258 employees, as shown by the accompanying diagram. The scope of the most recent activities is indicated by the weekly records, that for the week ending July 5, 1919, gives registrations, 74,703; help wanted, 83,843; referred, 65,597; placements, 53,587; for the week ending July 26, 1919, registrations, 95,619; help wanted, 91,222; referred, 75,052; placements, 65,998; week ending January 31, 1920, registrations, 36,243; help wanted, 47,214; referred, 38,306; placements, 30,990; week ending May 29, 1920, registrations, 49,168; help wanted, 65,804 referred, 49,884; placements, 43,247.

It is evident that this system is potential for valuable service to labor and to employers and that it should be utilized and appreciated by both. Great efforts should be made to avoid any partiality for either union or non-union labor, and both organization and individual laborers, and individual and associated employers, should file regular reports with the division, whether or not they are in need of its assistance.

Increased results should also be secured by co-operation with the principal associations, organizations and federations of general contractors, municipalities, manufacturers and all other large employers of labor, including farmers.

Some means of simplifying this service by inspection and classification of labor so as to secure the best men fitted for the work and rate them

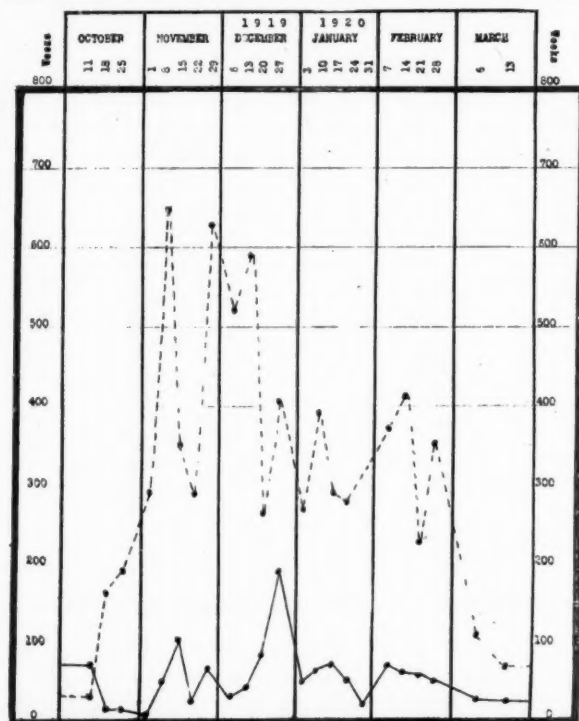


CHART SHOWING REPORTED SHIPMENTS OF LABOR, WEEKLY, BETWEEN STATES FOR PERIOD UNDER STATE FEDERAL OPERATIONS, OCT. 11, 1919 TO MARCH 13, 1920  
SKILLED—UNSKILLED  
FIRST COLUMN, NUMBER OF PERSONS TRANSFERRED

| Total Activities Week Ended July 17, 1920. |                    |                |          |                 |
|--|--------------------|----------------|----------|-----------------|
| State                                      | Regis-<br>trations | Help<br>Wanted | Referred | Place-<br>ments |
| Alabama .....                              | 136                | 105            | 81       | 46              |
| Arkansas .....                             | 32                 | 33             | 29       | 22              |
| Colorado .....                             | 1,315              | 979            | 566      | 540             |
| Connecticut .....                          | 1,066              | 1,068          | 941      | 864             |
| Dist of Columbia..                         | 731                | 619            | 495      | 382             |
| Georgia .....                              | 92                 | 35             | 62       | 22              |
| Illinois .....                             | 6,573              | 6,613          | 5,805    | 5,166           |
| Indiana .....                              | 454                | 589            | 418      | 398             |
| Kansas .....                               | 736                | 762            | 631      | 468             |
| Kentucky .....                             | 75                 | 16             | 33       | 8               |
| Louisiana .....                            | 105                | 111            | 89       | 88              |
| Massachusetts ....                         | 564                | 1,004          | 1,233    | 676             |
| Michigan .....                             | 2,137              | 1,970          | 1,710    | 1,676           |
| Minnesota .....                            | 2,300              | 2,940          | 2,279    | 1,827           |
| Missouri .....                             | 1,517              | 1,444          | 1,370    | 1,361           |
| Nebraska .....                             | 1,107              | 1,110          | 1,055    | 1,031           |
| New York .....                             | 9,081              | 8,697          | 8,258    | 7,517           |
| North Carolina ...                         | 46                 | 40             | 45       | 44              |
| North Dakota ....                          | 309                | 323            | 279      | 256             |
| Ohio .....                                 | 8,743              | 6,324          | 5,736    | 4,880           |
| Oklahoma .....                             | 1,179              | 1,179          | 1,095    | 975             |
| Oregon .....                               | 1,040              | 1,031          | 1,043    | 979             |
| Pennsylvania ....                          | 5,789              | 11,672         | 5,251    | 5,006           |
| Rhode Island ....                          | 130                | 136            | 202      | 118             |
| South Dakota ....                          | 168                | 147            | 93       | 71              |
| Texas .....                                | 382                | 251            | 262      | 107             |
| Virginia .....                             | 125                | 170            | 98       | 84              |
| Washington .....                           | 1,199              | 1,074          | 1,029    | 937             |
| West Virginia ....                         | 223                | 327            | 217      | 214             |
| Wisconsin .....                            | 2,402              | 3,203          | 2,397    | 1,833           |
| Total 30 states..                          | 49,756             | 53,972         | 42,802   | 37,596          |

according to their abilities would be helpful. Further efforts along the lines of transferring men from a crowded trade or area to one in which there is a chronic deficiency would also be desirable to both parties and would tend to equilibrium and standardization. Such discrimination might perhaps be extended even so far as the arbitrary allotment of certain classes of immigrants to appropriate localities, thus relieving the congestion in cities and the labor famine in other places.

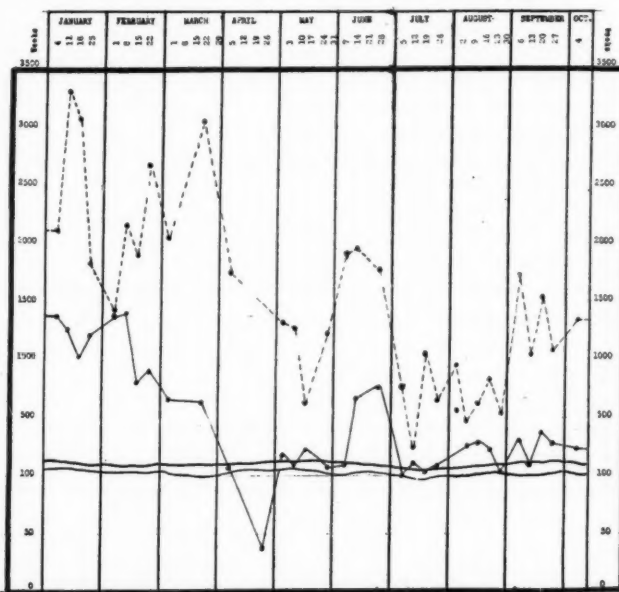


CHART SHOWING REPORTED SHIPMENTS OF LABOR, WEEKLY, BETWEEN STATES FOR PERIOD UNDER FEDERAL OPERATION, JAN. 4 TO OCT. 4, 1919.  
SKILLED—UNSKILLED  
FIRST COLUMN, NUMBER OF PERSONS TRANSFERRED  
RECORD OF ACTIVITIES FOR WEEK ENDING AUGUST, 1920.

# PUBLIC WORKS.

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## Labor Efficiency

By far the most important essential for labor is efficiency, that is, the nearest possible approach to the execution of 100 per cent of each man's ultimate possibilities. Efficiency depends on willingness, ability, opportunity and direction. At present it is greatly decreased, probably from 30 to 60 per cent in nearly all classes of skilled and unskilled labor. Most of this is doubtless due to unwillingness directly caused by excessive wages and by pernicious agitation.

Willingness will be greater when the country is purged of agitators, socialists, anarchists, I. W. W.'s and other pernicious classes and when the average worker feels the necessity for himself and family; in other words, when he receives only a just compensation proportioned to his results and to general values.

Ability can be greatly increased by classification of employment, by careful selection of men for different tasks, and by manual training and various systems of education in the shop, in the field and even in the school or lecture room.

Opportunity is largely a matter of method and organization dependent on the employer, the character of the work, and the attitude of labor itself and the leaders of its unions. Organization of labor forces on the work is an important essential and requires great skill and experience for its complete success. Men should be assigned in groups to tasks for which they are best qualified, and the different groups should be carefully located and scheduled so as to co-operate to the highest degree and to avoid all conflict and delay.

Men work much more efficiently in small groups than they do either singly or in large gangs, a fact that is recognized by the statement in this issue quoted by a manufacturer's circular that "Two men shoveling together will do twice as much as when shoveling separately." The quality and quantity of work is greatly improved by promoting and maintaining rivalry between gangs who strive to excel each other through pride or to secure a promised reward.

Direction of labor requires a high degree of administrative skill and thorough knowledge of all the details of the work in hand. The work should be supervised as a whole and each element should be directed with an intimate knowledge of every detail. The men should be treated with uniform decision and justice to themselves and their employers, each being required to do a fair day's work for a fair day's pay. The separate operations should be very carefully arranged and synchronized to avoid all conflict, interference, or delay, and all materials and equipment should be ready in advance of requirements. Especial pains should be taken to direct the movements of the men in the simplest and most direct manner, cutting out all superfluous operations and especially preventing any inefficiency of part of the force causing delay to the remainder.

By adopting as many as possible of these suggestions, almost any construction job will be notably expedited and its cost correspondingly reduced.



### Equipment Profits

Construction plant and equipment is either stock property of a standard character which is constantly maintained by the contractor or it is special or provided as occasion demands. Complete and accurate accounts should be kept of both, the former being classified as permanent investment and charged to overhead expenses while the latter is accounted to current work. In either case, the charges should include first cost, amortization, depreciation, maintenance, repairs, insurance, interest, storage, transportation, rental and lost time, if any.

The plant should be credited with the actual work done, with any rent received and with the inventory price or the salvage received at the end of the job or at inventory time; while it should be charged with superintendents, supplies, wages of operators and the other items mentioned.

The installation of any plant or equipment on construction work is justified first, if it is absolutely indispensable to the execution of the contract or its safety; second, if its use expedites the work sufficiently to overbalance any direct loss that may be incurred over the performance of the work by other methods; and, generally, if the total cost of the completed work is reduced by the use of the given equipment over what it would be by the best method of doing it without this equipment.

It follows that the amount of work actually performed by the equipment may be much more important in the selection of apparatus than the unit cost of performance; as, for instance, the excavation of 500 yards of earth at 20 cents per yard by a steam shovel may not be justified when a \$15,000 steam shovel is used one or two days only and involves a cost of \$100 or more for installation and excessive cost for removal of spoil, although the direct cost of the excavation by hand may be 50 cents per yard without any installation or extra removal costs and may be done with available forces distributed over a longer period.

In these days when labor is so costly, inefficient and unreliable, it is axiomatic that the use of power plants, labor-saving machinery and

equipment are justified where the installation, operation and overhead charges are even nearly as low as the estimated labor costs, because of the saving in time and the elimination of labor troubles.

Wherever standard appliances are involved that can readily be bought and sold in open market and do not necessitate heavy permanent investment, or where they form part of the contractor's standard stock equipment, their use is justified when the overhead and operating charges are less than the cost of the force they replace and the purchase of such an apparatus is good policy when there is an abundance of work for them and the saving equals the interest and amortization charges on the investment. It is surprising how much machinery will be justified by elimination of three or four laborers.

In order to get the highest profits from equipment investment, the plant must always be under the supervision of competent mechanics, frequently inspected and maintained in perfect operative condition. Defective parts must immediately be renewed, injuries repaired, spare parts likely to be needed kept in reserve to prevent loss of time when renewed, and the machine must always be kept in perfect alignment and adjustment, well oiled and clean.

The machine and its crew must be protected from the weather and from accidental or malicious injury and the work must be so arranged as to operate the machine as continuously as possible and to its fullest capacity with the smallest crew. If movable, arrangements should be made in advance for shifting it without delaying the work or hindering its crew, and provision should be made in advance for the character and quantity of material it handles so that no obstruction or delay will occur when these are varied.

Under such conditions, with large contracts, ordinary requirements and fair prices, many machines will pay for themselves in a short time and thereafter earn large dividends for their owners. This is notably the case with excavating machinery, concrete mixers and some other kinds of plant.

---

## Immigration Before and After the War

---

Yearly pre-war arrivals of more than 1,380,000 were reduced to 295,403 in 1917, reduced by emigration, and at the present time are at the rapidly increasing rate of more than 1,000,000

---

In the year ending June 30, 1914, there were admitted to the United States 839,755 males and 440,553 females, making a total of 1,380,308 immigrants of all classes and from all countries.

For the year ending June 30, 1913, which was wholly uninfluenced by the beginning of the war, the total number of immigrants admitted was 1,197,892.

In the year ending June 30, 1919 (the latest for which the immigration reports have been published), immigration increased to 141,132 from 110,618 in the previous year, but was almost completely cancelled by the departure of 123,522 immigrant aliens, who left this country for permanent residence abroad; leaving a net increase of population of only 20,790, and not all of this rep-

Net Increase or Decrease of Population By Arrival and Departure  
of Aliens, Fiscal Year Ended June 30, 1919.

|                                    | Immigrant<br>aliens. | Emigrant<br>aliens. | Increase<br>(*) or de-<br>crease<br>(x). Includ-<br>ing non-emigrant<br>aliens. |
|------------------------------------|----------------------|---------------------|---|
| African (black) .....              | 5,823                | 976                 | * 8,258   |
| Armenian .....                     | 282                  | 11                  | * 351   |
| Bohemian and Moravian .....        | 105                  | 412                 | x 307   |
| Bulgarian, Serbian, Montenegrin... | 205                  | 3,241               | x 2,936   |
| Chinese .....                      | 1,697                | 2,062               | x 504   |
| Croatian and Slovenian .....       | 23                   | 154                 | x 136   |
| Cuban .....                        | 1,169                | 898                 | * 435   |
| Dalmatian, Bosnian, Herzegovinian  | 4                    | 2                   | * 2   |
| Dutch and Flemish .....            | 2,735                | 1,356               | * 1,379   |
| East Indian .....                  | 68                   | 106                 | x 38  |
| English .....                      | 26,889               | 9,406               | * 17,341  |
| Finnish .....                      | 968                  | 497                 | * 471   |
| French .....                       | 12,598               | 5,472               | * 7,126   |
| German .....                       | 1,837                | 343                 | * 1,494   |
| Greek .....                        | 813                  | 15,562              | x 14,749  |
| Hebrew .....                       | 3,055                | 373                 | * 2,682   |
| Irish .....                        | 7,910                | 1,934               | * 5,976   |
| Italian (north) .....              | 1,236                | 1,195               | * 41  |
| Italian (south) .....              | 2,137                | 36,980              | x 34,843  |
| Japanese .....                     | 10,056               | 2,127               | * 7,929   |
| Korean .....                       | 77                   | 23                  | * 54  |
| Lithuanian .....                   | 160                  | 6                   | * 154   |
| Magyar .....                       | 52                   | 10                  | * 42  |
| Mexican .....                      | 28,844               | 17,793              | * 11,051  |
| Pacific Islander .....             | 6                    | 2                   | * 4   |
| Polish .....                       | 732                  | 153                 | * 579   |
| Portuguese .....                   | 1,574                | 3,525               | x 1,951   |
| Roumanian .....                    | 89                   | 60                  | * 29  |
| Russian .....                      | 1,532                | 1,717               | x 185   |
| Ruthenian (Russniak) .....         | 103                  | 2                   | * 101   |
| Scandinavian .....                 | 8,261                | 4,865               | * 3,396   |
| Scotch .....                       | 10,364               | 1,687               | * 8,677   |
| Slovak .....                       | 85                   | 1,150               | x 1,065   |
| Spanish .....                      | 4,224                | 7,489               | x 3,265   |
| Spanish American .....             | 3,092                | 799                 | * 2,293   |
| Syrian .....                       | 231                  | 132                 | * 100   |
| Turkish .....                      | 18                   | 275                 | x 257   |
| Welsh .....                        | 698                  | 156                 | * 542   |
| West Indian (except Cuban) .....   | 1,223                | 336                 | * 887   |
| Other peoples .....                | 247                  | 235                 | * 12  |
| Total .....                        | 141,132              | 123,522             | * 17,610  |

resents increased labor supply, since it includes women, children and other dependents in workmen's families.

During the year, 20,643 aliens were temporarily admitted from Mexico by the operation of the Limited War Emergency Authorization, which suspended the provisions of the law regarding contract labor, head tax and illiteracy test. Of these laborers, 10,941 were engaged in agricultural work, 9,998 for railroad work, 89 for government construction work and 65 for mining. Under these provisions, from 1917 up to the termination of the exemption in 1918, a total of 29,563 laborers were admitted from Mexico, of which, at the date of this report, 9,036 had returned. The principal destinations of these laborers when admitted were Texas, 8,636; Arizona, 6,803; California, 6,382; Idaho, 1,549; New Mexico, 1,292; Kansas, 1,147. Similarly there were admitted 3,259 negro laborers from the Bahama Islands, of which 669 were employed by truck farmers in Florida and 2,590 were employed by contractors of government construction work at Charleston, S. C. Most of these have already returned to their homes.

There have also been brought from Porto Rico, under the direction of the War Department, 13,095 laborers who were not aliens and all of whom have since returned to their homes.

During the year terminating June 30, 1919, 8,626 aliens were excluded under the law or 3.5 per cent of the number applying for entry, as

compared with 2.3 per cent in 1918 and 5.3 per cent in 1915. During this year 1,455 aliens were excluded for illiteracy, 514 were excluded for immorality, 436 criminals and 39 anarchists, these figures including those previously admitted and deported during the year. About 4,000 aliens (46 per cent of all rejections) were excluded as likely to become public charges.

Aliens Admitted To and Departed from the United States from  
July 1, 1919, to March 31, 1920.

|                       | Immigrant | Emigrant |
|-----------------------|-----------|----------|
| July, 1919 .....      | 18,152    | 25,757   |
| August, 1919 .....    | 20,597    | 28,934   |
| September, 1919 ..... | 26,584    | 27,770   |
| October, 1919 .....   | 32,418    | 25,447   |
| November, 1919 .....  | 27,219    | 36,105   |
| December, 1919 .....  | 37,913    | 22,199   |
| January, 1920 .....   | 31,858    | 27,086   |
| February, 1920 .....  | 30,606    | 11,607   |
| March, 1920 .....     | 39,971    | 22,639   |

Intended Future Permanent Residence of Immigrant Aliens  
Admitted and Last Permanent Residence of Emigrant  
Aliens Departed, During Six Months  
Ended December 31, 1919.

| States.                 | Immi-<br>grant. | Emi-<br>grant. | States.              | Immi-<br>grant. | Emi-<br>grant. |
|-------------------------|-----------------|----------------|----------------------|-----------------|----------------|
| Alabama .....           | 250             | 116            | Nevada .....         | 248             | 128            |
| Alaska .....            | 91              | 68             | New Hampshire .....  | 1,696           | 644            |
| Arizona .....           | 2,586           | 1,044          | New Jersey .....     | 5,185           | 6,602          |
| Arkansas .....          | 68              | 22             | New Mexico .....     | 443             | 360            |
| California .....        | 14,368          | 8,058          | New York .....       | 38,093          | 54,077         |
| Colorado .....          | 529             | 836            | North Carolina ..... | 140             | 54             |
| Connecticut .....       | 3,740           | 4,048          | North Dakota .....   | 568             | 276            |
| Delaware .....          | 168             | 261            | Ohio .....           | 4,173           | 16,516         |
| Dist. of Columbia ..... | 917             | 420            | Oklahoma .....       | 233             | 119            |
| Florida .....           | 1,857           | 1,493          | Oregon .....         | 1,544           | 497            |
| Georgia .....           | 258             | 142            | Pennsylvania .....   | 7,879           | 24,743         |
| Hawaii .....            | 1,425           | 361            | Philippine Is. ..... | 7               | 4              |
| Idaho .....             | 472             | 169            | Porto Rico .....     | 267             | 369            |
| Illinois .....          | 6,415           | 9,677          | Rhode Island .....   | 2,697           | 2,071          |
| Indiana .....           | 856             | 1,618          | South Carolina ..... | 104             | 61             |
| Iowa .....              | 1,003           | 614            | South Dakota .....   | 425             | 135            |
| Kansas .....            | 382             | 429            | Tennessee .....      | 193             | 66             |
| Kentucky .....          | 145             | 92             | Texas .....          | 16,977          | 1,567          |
| Louisiana .....         | 862             | 349            | Utah .....           | 520             | 447            |
| Maine .....             | 2,742           | 575            | Vermont .....        | 1,726           | 322            |
| Maryland .....          | 688             | 618            | Virginia .....       | 1,232           | 299            |
| Massachusetts .....     | 15,299          | 10,931         | Virgin Islands ..... | 9               | 2              |
| Michigan .....          | 10,799          | 6,149          | Washington .....     | 5,704           | 1,638          |
| Minnesota .....         | 2,573           | 1,839          | West Virginia .....  | 507             | 1,652          |
| Mississippi .....       | 109             | 51             | Wisconsin .....      | 1,352           | 1,638          |
| Missouri .....          | 893             | 857            | Wyoming .....        | 224             | 171            |
| Montana .....           | 779             | 487            |                      |                 |                |
| Nebraska .....          | 463             | 430            | Total .....          | 162,883         | 166,212        |

Of the immigrants entering during the last six months of 1919, 76,048 were from Europe, 6,795 from Asia, 45,843 from British North America, 22,857 from Mexico and 11,340 from other parts of the world. Of the Europeans, 28,837 were from Italy, 12,717 from England, 3,300 from Scotland and 2,084 from Ireland, 4,794 from France, 4,366 from Portugal, 3,541 from Spain, no other country contributing more than 2,700. But during the same period, 67,371 returned to Italy and 2,750 to Ireland, leaving a net loss of those nationalities. Altogether 76,048 came from Europe and 148,325 returned there; a net loss of 72,275 Europeans.

Of 6,795 Asiatics arriving, 4,675 were from Japan and 1,295 from China; while 2,217 Japanese and 1,656 Chinese left this country, leaving a net gain of 2,135 Asiatics.

Each of the other countries gave us a net gain, only 4,404 Canadians returning home. But there was a net loss, counting all countries, of 3,329.

Examining the occupation of the immigrants arriving during the last six months of 1919, we find that 6,408 were professional men; 25,849 were skilled workers, clerks and accountants, mariners, carpenters, machinists, dressmakers, miners and unclassified mechanics, in the order named, being



the largest classification; while there were 20,375 laborers, 3,970 farm laborers, 4,186 farmers, and 240 teamsters and hackmen. There was a net gain of 4,250 professional men, 14,131 skilled laborers, 2,224 farm laborers, 255 farmers, but a loss of 88,833 laborers.

Reports of immigration during the latter part of September, 1920, show the arrival of aliens from Europe at the rate of more than 20,000 per week with several days having a record of 9,000, which, if maintained, would be more than 3,250,000 in a year. It is not, of course, practicable to secure any such number, but predictions have

been made that there will be 1,500,000 admitted within the next twelve months and there have already been as many as seven shiploads of immigrants anchored in New York harbor at one time waiting an opportunity to land their steerage passengers.

It is reported from Warsaw that from 500 to 1,000 Polish Jews are daily receiving passports and visas to the United States, as many as 8,000 having been in line for that purpose at one time. As there are more than 100,000,000 peasants in Russia, the supply is sufficient to keep this rate up for a long time.

## Price Fluctuations

The peak has been passed here and abroad.  
Conditions here are superior to those in  
Europe.

The first instance of important price reduction since the close of the war was the voluntary action of the United States Steel Company in making a heavy cut in prices on structural steel and other products last year. Occasional minor reductions, often followed by corresponding increases, have occurred in many commodities, but in general the range of our prices, especially for food, clothing and rent, has increased continually but at a very reduced rate up to a recent period.

Last spring a conspicuous effort was made to promote reductions by large department stores in the principal cities, which made flat reductions of 10 to 20 per cent. More recently the largest automobile manufacturer has announced a large reduction which he promises will be met, if possible, by lower payments for materials rather than by a cut in wages. This was followed only a few days ago by a general reduction of 10 to 20 per cent in mail order prices applying largely to clothing, furniture and the like. In some sections of the country food has become cheaper but, although the crops have been unusually good, the consumers in the large cities, especially in the East, have received little or no benefit from this and in some cases the prices, especially for perishable articles, are still rising.

The very much belated and inefficient, not to say indifferent, efforts of the government to distribute excess war supplies to citizens have had little effect, apparently because of the imperfect distribution and guarantees and because a large amount of the supplies were acquired by dealers who immediately put them on the market at or near current prices.

The relief that might have been obtained by proper disposal of excess equipment such as automobiles, aeroplanes, large quantities of various kinds of machinery, as well as the stupendously costly camps and cantonments built as emergency construction, has been practically eliminated by the policy of neglect and even wanton destruction

or of selling abroad or of abandoning or turning over to speculative purchasers at a small fraction of their cost and current value, when they might well have been maintained for a better market or adapted to remunerative commercial purposes.

### PRICES BEGINNING TO FALL

Nevertheless, able financiers and trained observers unite in the opinion that the crest of high prices has been reached. The conservative **Monthly Review**, issued by the Federal Reserve Agent, New York, states under date of August 28 that within a month there has obtained a downward tendency in important commodities, such as sugar, coffee, grain, potatoes, cotton and tin, many of them being raw or semi-manufactured goods, which will not maintain the same reduction when subjected to labor charges in their route to the ultimate consumer, although all domestic indices show some decline during the past month.

Such declines are due mostly to increased actual or prospective supply through decreased demand, or to the release of speculative stocks, so that, while some prices were increasing and many were stable, the large number of important commodities that have been separately reduced indicate the increased operation of the natural laws of supply and demand. The retail prices, however, which rose more slowly than did the wholesale prices, are correspondingly slow in falling, and have not yet shown much appreciable decline.

In some instances the high prices are in no way warranted by legitimate costs, as in the case of lumber which, in the Ohio Valley, has been quoted at \$50 per thousand above the price in Oregon plus transportation charges, a condition which may perhaps be due to the frantic competition of purchasers to fill present wants regardless of price.

Much encouragement should be felt from the fact that, with the exception of Japan, the wholesale prices in the United States have been constantly much lower than in any of the other allied



nations. In 1914 and 1915 they showed no rise, in 1916 the rise was less than 30 per cent, in 1917 they had risen only about 70 per cent, and in 1918 about 100 per cent above 1913.

In 1919, however, when prices were expected to decline, the rise was accelerated to an increased total of about 140 per cent and continued to rise until near the middle of 1920, when it attained a maximum of about 170 per cent over 1913. But at the same date the increase was about 210 per cent for Great Britain and Ireland, 220 per cent for Japan, 475 per cent for France, and about 555 per cent for Italy. Last June, however, the French summit dropped 10.4 per cent and is now 15.6 per cent below the April peak. In Japan it has fallen 25.6 per cent below the March peak.

Indexed prices compiled by the United States Bureau of Labor, the Federal Reserve Bank, Dun's and Bradstreet's, show, for the first of August, declines of 2.6, 1.9, 3.1 and 2.7 per cent, respectively, with total declines from the highest point of 3.68, 7.3, 4.2 and 9.7, respectively; the average of these declines from the high point being 6.22 per cent as compared with averages for Great Britain of 5 per cent, France 15.58 per cent, Italy 9.57, Japan 25.55, Canada 1.90, Sweden 0.5 per cent; all percentages of increases being converted to the 1913 basis.

In studying the probable relation of wages and cost of material to decreased prices, the Bank Review gives comparative diagrams of the course of prices and wages in England at the time of the Napoleonic war and in America at the time of the civil war. In England the prices declined at first rapidly and then steadily, and wages were gradually diminished but to a much less degree, for a long series of years.

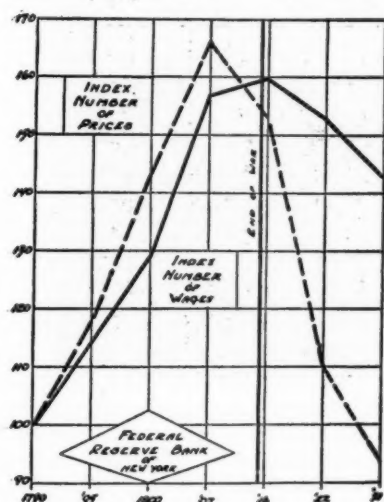
For thirteen years after the civil war prices (in currency which was worth less than gold) dropped rapidly, while for seven years wages continued to rise and then dropped for seven years on a line approximately parallel with the continued fall of prices.

Since these wars, conditions have changed so much throughout the world that a close parallel to former events cannot be predicted, and although the law of supply and demand is eventually bound to prevail, the effect of political policies and powerful labor organizations which bitterly resist wage reductions, will undoubtedly delay and reduce wage reductions and effect a permanent change to a higher plane of living available to labor with its increased earnings, while it makes greater economy and efficiency necessary to secure the increased production which alone will permanently maintain higher wages.

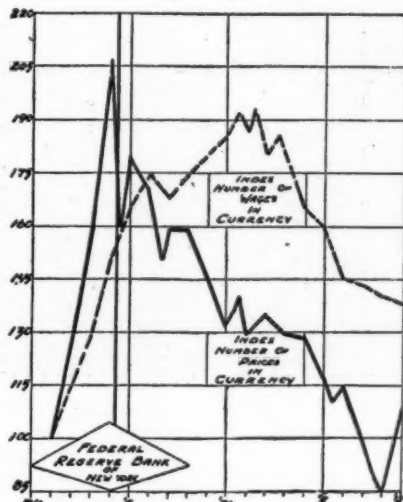
The elimination of unnecessary work and of extravagant expenditures, together with the increased supply of foreign labor, will steadily reduce and perhaps reverse the labor deficiency, jobs will be better appreciated, labor turnover will be diminished, wages will gradually fall, and above all, industry and reliability will be demanded and the unit of production of the individual will be much more closely proportioned to his remuneration. The more these two factors are balanced the larger the profits to the individual and the greater the prosperity of the country will be.

### Water Power to Save Oil

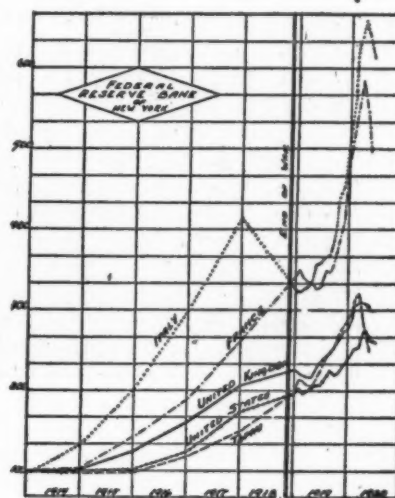
The development of hydro-electric power in California is being urged not only because of the cheaper power which it will furnish but also because the substituting of hydro-electric power for that created by fuel oil power plants will save many thousands of barrels of oil a day. The last week in August one company asked permission of the State Railroad Commission to spend \$125,000,000 for the development of hydro-electric power, installing a plant with 515,000 h.p. in the mountains. It is estimated that this one plant will save 35,000 barrels of oil a day. Five power houses would be constructed and a seven mile concrete tunnel built. The company making the request is the Mt. Shasta Power Company.



COURSE OF PRICES AND WAGES IN GREAT BRITAIN DURING AND AFTER THE NAPOLEONIC WARS



COURSE OF PRICES AND WAGES IN UNITED STATES DURING AND AFTER THE CIVIL WAR



MOVEMENT OF WHOLESALE PRICES IN FIVE LEADING COUNTRIES. PRICES FOR 1913 TAKEN AS A BASE OF 100

# Contractors' Equipment and Tools

Several weeks ago Public Works requested from prominent manufacturers and dealers data descriptive of new machinery or equipment or improvements on them made since January 1, 1918, for publication in this issue. Some information received in response to this request does not specify whether or not it embraces new features but is still of value to our readers. Wherever it has been definitely stated or it is evident that the articles are new or recently improved, specific mention is made in the respective descriptions, which are here presented, together with as many of the others as the space limits of this issue permit.

## Road Building Machinery and Appliances

### Important Road Building Machinery

By WILLIAM E. VOORHEES\*

Of all the various machines used in the construction of the modern highway, the most important is the rock crusher. The scraper, the plow, the steam shovel, the paving mixer, the truck and the road roller—all of these are very necessary appliances in road building, if the work is to be carried on smoothly, economically and with any degree of speed. If none of these ma-

When John MacAdam, more than a century ago, conceived the method of stone road construction which still bears his name, his specifications covered stone to be broken by hand to a certain degree of fineness. But at that time labor was cheap and machinery was practically unknown, and the methods that obtained in that day are no more applicable to present-day conditions than the old stage coach and lumbering cart are comparable with the present high-powered automobile and truck.

Machines for crushing rock have been made in this country since the middle of the last century, but it has only been within the past two decades that the rock crusher has become a vital factor



GOOD ROADS MACHINERY CO'S CONVEYOR AND CRUSHER ON THE TOBYHANNA, PA., ROAD

chines was available, however, road work could still be carried on in a limited way. But if the modern rock crusher was entirely eliminated, practically no roads under the conditions that prevail to-day could be built.

\*Of the Good Roads Machinery Company.

in the work of road building. The reason for this is that little attention was given to the question of highway improvement until the beginning of the present century. The advent of the automobile, with its increasing use, and, later, the marvelous growth in the use of the automobile

truck, necessitated the planning for a nation-wide system of hard-surfaced highways.

The rock crusher is the most important machine used in highway construction because crushed rock is the basis of practically all types of permanent roads. Whether the roadway is a water-bound or an oil-bound macadam or a concrete highway, the bulk of the material entering into its construction is crushed rock. When labor was cheap, and stone roads were being built in a very limited way, the napping hammer was an exceedingly useful tool. Today, leaving entirely aside the matter of cost, it would be physically impossible to build even a very insignificant part of our permanent highways if it were not for the multitude of rock crushers that yearly hammer out millions of tons of material for road purpose.

Rock crushing plants, as used to-day in producing crushed material, may be divided into two classes: the stationary and the portable plant.

Where stone quarries are located along the line of a railroad, the stationary plant consisting of a large-size crusher, elevators, screens and conveyors, is used. Some of these stationary crushers are of mammoth size with openings large enough to take in a dozen tons of stone at one time. The stationary crushing outfits range in size from the small plant costing but a few thou-

sand dollars and capable of producing from two hundred to five hundred tons per day, to the large plant costing thousands of dollars and capable of turning out several thousand tons of crushed material daily.

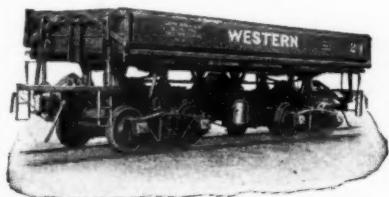
The portable plant usually consists of a crusher, elevator, revolving screen and stone bin, all mounted on wheels, so that the complete outfit can be readily moved from point to point. Such plants are generally located at some distance from the line of a railway and close to the job where the stone is to be used. Crushers used in connection with portable plants have capacities ranging from seventy-five to three hundred tons daily. By the introduction of high-grade steel, present-day manufacturers have been able to build portable crushing plants of large capacities, but comparatively light in weight. Such outfits usually weigh from four to eight tons.

In spite of improved methods for producing crushed stone, the present program for road construction in this country has created a situation where the demand largely exceeds the supply. It would seem, therefore, that wherever good stone for road-building purposes is available, the practically assured financial returns should be an excellent inducement for the installation either of a permanent or a portable rock crushing outfit.

## Western Wheeled Scraper Company

### SIMPLIFIED AIR-DUMPING DEVICE

The Western Air-Dump cars are now made with vertical instead of horizontal cylinders in the following sizes: 12-yard, 16-yard, 20-yard, 25-yard and 30-yard. The 30-yard car is made with twin vertical cylinders because of its greater size, in order to equalize the strain. The air-dumping device has been simplified. In operat-



AIR-DUMP CAR WITH TWIN VERTICAL CYLINDERS

ing, the piston head now engages directly with the body of the car through a pivoted bearing, the thrust being applied near the outer edge of the car bottom. This gives the greatest possible leverage and reduces the amount of power required to tip the bed, while the direct engagement with the car body enables the total power of the air pressure in the cylinder to be utilized. There is no power lost. This gives greatly increased dumping power with no greater consumption of air.

**Forty-five-Yard Car.** A 45-yard car for carrying coal is a standard 30-yard car with top boxes added, giving it a greater capacity, which is practical for the service intended.

### NEW CRUSHER

The No. 0 crusher is the smallest size that this company manufactures and is made in response to the demand for a reasonably light machine that can be readily operated with an engine or motor and can be easily transported by a team or small tractor. It has a very satisfactory output.

### WESTERN DITCHER

The Western ditcher is a tool designed for cutting and grading irrigation ditches. The blade has been given the correct curvature for earth cutting. It is highly polished and both edges are filled with detachable bits, easily removed for sharpening. The front end of the blade is sharp, leaving no obstruction to catch and hold grass or rubbish and thus choke operation. The blade is easily adjustable to conform to the wear on the shoe and increasing depth of the ditch. The blade is 5 feet long, easily adjusted to any angle desired. The land side is fitted with hard steel fins on both front and rear ends, on which all side draft is carried. The ditcher is reversed simply by turning it over, removing and replacing the cotter in lower end of each draft beam.

### No. 4 FRESNO

The new Fresno scraper, 3 feet long, is one size smaller than the smallest heretofore manufactured. It is of light construction suited for handling light material.



## DIRT PAN CLEANER

The Western elevating grader is now fitted with a dirt-pan cleaner by means of which the operator can keep the belt from clogging. The device consists of a hand lever and other necessary parts for operating the pan scraper. Heretofore on all makes of machines it has been necessary for the operator to make frequent stops and clean off the pan with a stick to prevent clogging.

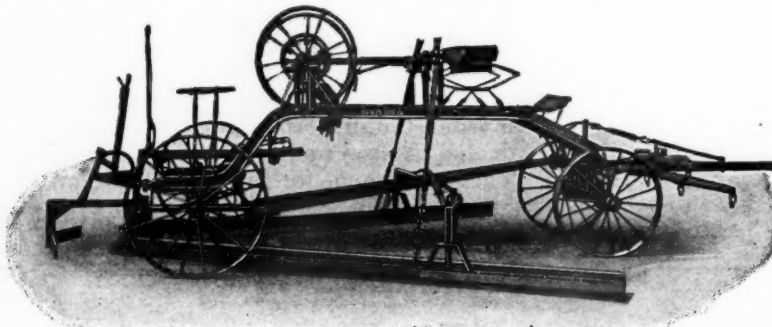
## WESTERN ROAD PLANER ATTACHMENT

This consists of two 13-foot blades under perfect control, with a spread of about 16 feet. Each blade has two shares, on both edges. Immediately behind the rear end of the blade is an adjustable spreader under independent control. The blades are spread by moving the machine forward, after they have been lowered. The device can be fitted to the frame of a road grader by the removal of the blade mechanism, thus quickly

## Heltzel Steel Forms

Steel forms made by the Heltzel Steel Form & Iron Company are designed for the construction of roads, pavements, highways, curbs, sidewalks, gutters, cisterns, sewers and manholes. They are made in various standards, for integral curb and base, for straight, battered and curved curbs, for combined curb and gutter and for special construction.

Heltzel rails are especially designed for use under automatic tamping and finishing machines. They are made of the highest grade, extra heavy, open hearth steel, fortified with additional depending flanges at both top and bottom. This construction insures the special strength and rigidity necessary to withstand the weight and



ROAD PLANER FITTED TO ROAD GRADE FRAME

converting the grader into combination leveler and drag, which in a single trip of the road will do the work of 6 men, 12 horses and 6 drags.

## WESTERN MIDGET GRADER

The Western Midget grader is a one-man, two-horse machine, with a five or six-foot blade and weighs about 1,000 pounds. It has practically the same adjustments that are found in the larger machines.

## WESTERN BATCH BOXES

Recently the Western Wheeled Scraper Co. has added to its line of road-building equipment Western batch boxes, Western road builders, trucks for carrying batch boxes, industrial railway and Western service cars for carrying the rail sections. The batch boxes are built both of oak and of steel and are of approximately 1 cubic yard and 2 cubic yards capacity. These boxes discharge their loads through bottom doors into the mixer. Boxes are made with one compartment for both aggregates or with three compartments, for sand, cement and gravel, respectively.

## WESTERN ROAD BUILDERS TRUCKS

These trucks are furnished for carrying batch boxes from the material yards to the mixer. One or two batch boxes, according to size, fit on each truck. The truck is of very strong construction throughout. It is readily convertible into a V-shape dump car by attachment of the arch supports and the body, parts being supplied for that purpose. The ends of the truck frame are built up with steel plates at the top and bottom, to give rigidity, enabling the car to resist bumper shocks. Capacity, three tons; gauge, 24 inches.



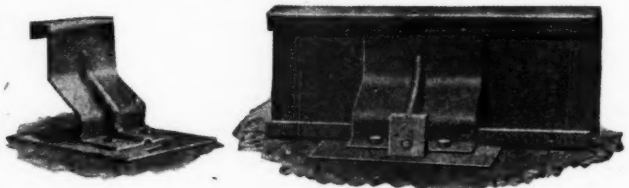
REVERSIBLE DITCHER WITH 5-FOOT BLADE

pounding of most finishing machines. It provides a bearing surface which ordinary rough treatment will not dent or buckle, causing waves in the road surface. The top flange is  $2\frac{1}{8}$  inches wide; the bottom flange is 4 inches wide, giving an extra large bearing surface and meeting all state specifications.

Besides the broad bottom flange, the rails are supported by a pedestal, which is an exclusive Heltzel feature. It gives the rail double direct support. The rail will not lean or buckle under the vibration of the machine. Creeping is prevented by a flat stake, which anchors the pedestal. The broad 7 x 10-inch base plate of the pedestal prevents sinking in marshy soil.

Rail junctions are also formed by the pedestal. One is placed between each two rail ends, and they butt together over it. This provides a simple, effective joint, instantly connected without hammering. Support is provided where most needed. All extending lugs, clips and attachments to the rail are eliminated. Two pedestals and two stakes are included with each rail.

In the integral curb and base form, the back rail hangs on an adjustable stake that gives instant grade adjustment within  $\frac{1}{4}$  inch by means



HELTZEL WIDE BASE RAIL JOINT AND SUPPORT

of a sliding clip. The rails are made in 12-foot sections slotted every 6 feet for division plates, and connected with tight, smooth joints made with a sleeve. The division plates prevent the rails from spreading under pressure of the concrete, and can easily be removed with a hook before the rails are stripped. Where division plates are not used, special overhead hangers are substituted for them.

The integral curb, gutter and base forms can be made of different dimensions by using special pieces combined with standard rail forms.

Straight curb forms are built up with pairs of double flange standard rails hung on adjustable steel angle stakes and can be set up with cheap labor in a fraction of the time required for wooden forms. They cannot spread at the bottom, and thus prevent loss of concrete. The cost of finishing the concrete is reduced 50 per cent by the smooth surface left when the steel is stripped.

The Heltzel "Lightning" car unloader is a steel chute closed at the lower end and provided with hook brackets by which it is attached to the side of a gondola car. It can be filled by shoveling while the trucks are absent and can load the latter immediately by opening the lower door, thus

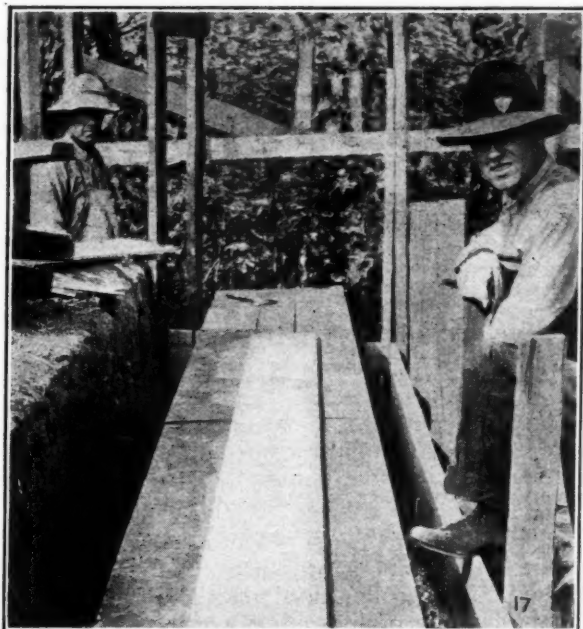
economizing time both for the shovelers and the trucks, a feature which saved 27 minutes per load and effected a labor economy of \$12.45 per day for George Geisel, street commissioner of Rahway, N. J. The unloader can be handled and installed easily by two men. The angle is adjusted by a controller lever and the steel door is operated by gravity. The unloaders are built in a 1-yard size weighing approximately 385 pounds and in a 1½-yard size weighing approximately 410 pounds.

The same company makes a steel strike-off with long guide handles at each end resting on the steel forms for concrete pavements. They also make the Parrish double beam template with two I beams curved to the crown of the road and carried by rollers engaging the steel side forms. The template is hauled forward by the concrete mixer and distributes the mortar evenly over the wet concrete.

Another road-building appliance made by the same manufacturers is a steel bulkhead with the top reinforced by a riveted angle-iron flange. The bulkhead is held in position by three patent pedestals having plates that extend into and under the concrete and are staked down by flat steel pins and are easily withdrawn after being used.

## Bilger Steel Culvert Forms

The Bilger steel forms are a permanent equipment, and are used in place of temporary and costly lumber forms in the construction of concrete culverts and bridges in highway, railway and other improvements.

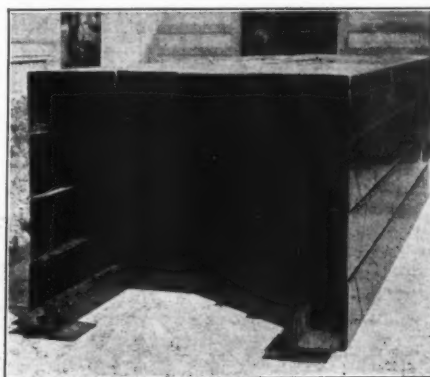


PLANK OUTER WALL ON ONE SIDE WHERE EARTH CAVED IN. TEMPORARY PLANKS ON SLIPPERY TOP PLATES

The forms are entirely free of castings, being made only of structural steel angles and plates,

any part of which could easily be repaired by a country blacksmith.

The design is strictly of the one-man type. A complete form for a 3-foot square culvert 36 feet



FORM ASSEMBLED

long, for example, can be set up ready for the concrete, or can be collapsed and removed from the completed culvert, by one ordinary laborer in 30 minutes.

The forms consist essentially of only three parts, namely, base angles, cover plates and centers. All base angles are alike, symmetrical and interchangeable to any position and to every size culvert the forms build. Likewise, all cover plates are alike, symmetrical and interchangeable to every size culvert the forms build, and also to either the side or top position of each size culvert.

There are no small parts to become lost, nor large parts to require more than one man; no duplication of parts to make the forms expensive, nor rights and lefts to puzzle the mind; nor are there any gears, levers, turnbuckles, cams, springs or other mechanism to become clogged with concrete or mud.

By a revision of the design of the centers, these forms now build on the foot and the half-foot any span, any height, and any ratio of span to height between the limits of 18 inches and 12 feet without any duplication of parts.

The forms are collapsed from either or both ends from the outside, merely by striking the projecting ends of the base angles with an axe or maul, driving them some 4 inches along on the concrete base. When the notch in the base angle comes under the center, the center drops, bringing the hooks out of the holes in the flanges of the cover plates, and the entire form is released at once and can be taken from the completed culvert piece by piece.

Every set of these Bilger forms is manufactured and guaranteed to build as many culverts as there are on any 100 miles of highway in America, and at a cost for the forms of less than one dollar per culvert built. The forms are manufactured by the Highway Culvert Form Co.

## The Scraper's Part in Road Work

By F. R. BUMPUS

Road machinery has kept pace with the development of various other lines of machinery. Not so many years ago "road machinery" meant perhaps a grader that could perform no other work than the grading of roads. To-day road machinery ranks among the most important products of American manufacturers, and perhaps more

wheel scraper. It was some twenty years ago that Smith & Sons Manufacturing Company developed the platform wheeler, or the one-man wheeler, as it is popularly known. At that time it was never thought that a greater improvement could be made in the wheeler. To-day this same company is producing the Roytrac, a tractor wheel scraper built in units, depending upon power requirements. This is being adopted by industries using earth as a raw product—such as cement and brick manufacturers.

The development of the tractor wheeler became necessary for two reasons: the ever-increasing demand for faster work, and the cost of labor and the inability to secure labor. The American Cement Plaster Company was first to realize the industrial possibilities of the tractor scraper and installed two units at its Acme, Texas, plant. The superintendent of the plant says:

We are using two units, each consisting of one Holt five-ton tractor and three No. 3 Roytrac wheelers, and they are putting in the same amount of work as twelve wheeler teams would do.

At the time we purchased the first of these machines we worked one of our best wheeler teams against the engine. The wheeler team was a fast team of horses, weighing 1,400 pounds each, and they pulled a No. 2 wheeler, 1 loading without the aid of a snatch team. The engine pulling three No. 3 Roytrac wheelers would make about four trips to the team's three. This will give a fair comparison of the amount of dirt handled with the team and machines, both making the same distance.

We are today putting in the same amount of dirt (400 yards) with four men, where we formerly used twelve. These beds are excavated to a depth of 12 feet, and the dirt is hauled about 1,200 feet to a trap.

The prime reason for adopting this method was the inability to get men that knew how to drive and care for teams, the high cost of feed and extreme high wages we had to pay drivers.



TRAIN OF ROYTRAC SCRAPERS HAULED TANDEM BY HOLT TRACTOR ON ROAD GRADING WORK

money is expended each year for the development of road machinery than in any other single industry. Road building has become an industry. It is no longer a side issue with the farmer, who once was the chief road builder of the nation, but to-day counties and states bid for experienced engineers and pay big money in the building. Roads are under supervision of men who devote their entire time to that and that only.

To keep pace with the evolution, manufacturers found it necessary to give these new road builders machinery that the road builder of yesterday never dreamed of. The general use of the tractor demanded an engine grader, and it was finally produced, but not without overcoming difficulties in construction.

Perhaps the greatest evolution was in the

## Pressure Cylinder Scarifiers

In the construction and maintenance of improved highways, the loosening of the old road surface for excavation or resurfacing is often one of the most expensive items of cost and amounts to a very high figure if attempted by hand picking.

Nearly all of this expense can be eliminated by the employment of a pressure cylinder scarifier attached to the roller used on the job. One of them is capable of loosening a mile or more of road surface in less than a day. The saving over hand picking will pay for the cost of the scarifier in the first few days used. The cost of operating a roller with scarifier is not appreciably greater than that for a roller not so equipped, as the





PRESSURE CYLINDER SCARIFIER IN OPERATION

roller operator also controls the scarifier, steam for which is taken from the roller boiler.

New Buffalo-Pitts and Kelly-Springfield rollers can be purchased with scarifiers attached, or the scarifiers can be bought separately and put on to old rollers already in service.

## The 1921 Rex Paver

The construction of the improved Rex concrete paving machine is provided for in the new Milwaukee plant built by the Chain Belt Company. Among the special advantages derived from the new features of this machine are the power-operated discharge chute and the positive, instantaneous action which shortens the time required for discharging mixed concrete from the drums. The drum is driven by clutches that can be engaged or disengaged by a slight motion of the operating lever in  $2\frac{1}{2}$  seconds to provide for the charging or discharging of the drums, thus making increase yardage possible.

In order to eliminate the expense and delay of providing planks or other tracks on which to move the advancing machine, it has been equipped with caterpillar traction that expedites and simplifies the movement and by reducing stresses in the frame of the heavy machine tends to increase its life.

A derrick, which is special equipment, is provided to handle batch boxes or aggregate and is

installed on the paver in such a manner that its truck will drag parallel with the paver's steering wheel without in any way affecting the three-point suspension of the paver.

The loading and dumping of the bucket is under ordinary control, thus relieving the operator of routine work and permitting the production of heavier concrete and more of it. The filled bucket travels away from the mixer by the operation of a clutch and the engagement of the return clutch releases the drop doors of the bucket, automatically returns the bucket for the next batch and closes the doors without attention from the operator. The operator can place the contents of the buckets anywhere within the length of the 20-foot boom or the swing of a 180-degree arc thus covering a large area that reduces the number of movements required for the advance of the machine.

The transmission mechanism is designed for the severest service and is made of heat treated steel alloy gears, hammer forged, nickel steel shafts operating in oil baths and is protected by being enclosed.

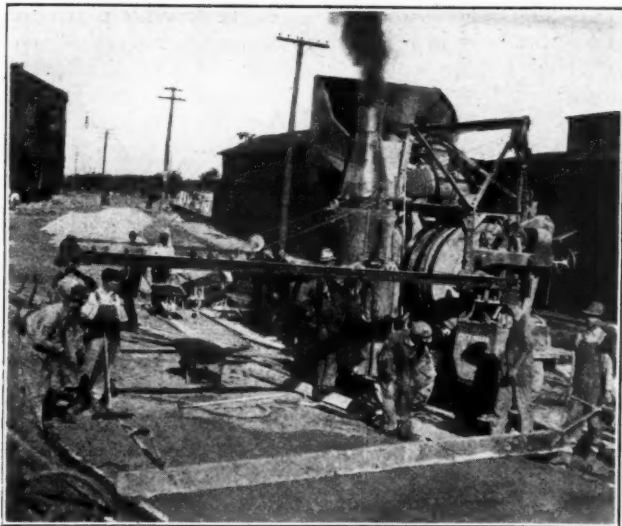
On the Du Pont highway in Delaware, W. P. McDonald & Company of Philadelphia laid up to 614 feet of 14-foot roadway a day with one Rex paver, the first of the 1921 type. The Du Pont representative had insisted that two machines be used to finish a 10-mile stretch on time. He had just come from a job where, because of repeated delays for adjustments and repairs, it took two pavers of another make to maintain the required 425-foot daily average. With the single Rex paver the McDonald company not only averaged 450 feet daily, but also demonstrated the stand-up ability of the paver by running continuously from the day they started this job until the day they finished without losing one minute by fault of the machine.

## Root Spring Scrapers

Scrapers manufactured by the Root Spring Scraper Company are designed for attachment to trucks or trolley cars to keep the roads in condition in summer-time and to clear them of heavy snow in winter. They may be used either on country roads or city streets.

The standard size for trucks is 10 feet long. For installation there is required about 20 inches clearance below the bottom of the truck frame. The plates are 12 inches wide and are provided with five steel springs. They are operated from the driver's seat by a windlass and chain, which raise and lower the scraper according to the pressure desired by the operator. They are equally efficient for handling sand, gravel, and light or wet snow, and do not require change after being adjusted to the given conditions.

These scrapers are used by about sixty railroads and street-car lines. The No. 6 is stated to save half the expense of handling snow and operates at the same cost and with one-half the power of a sweeper.



REX PAVER OWNED BY GRANT SMITH CO., ST. PAUL, AT WORK AT RED WING, MINNESOTA

# Tractors and Trailers

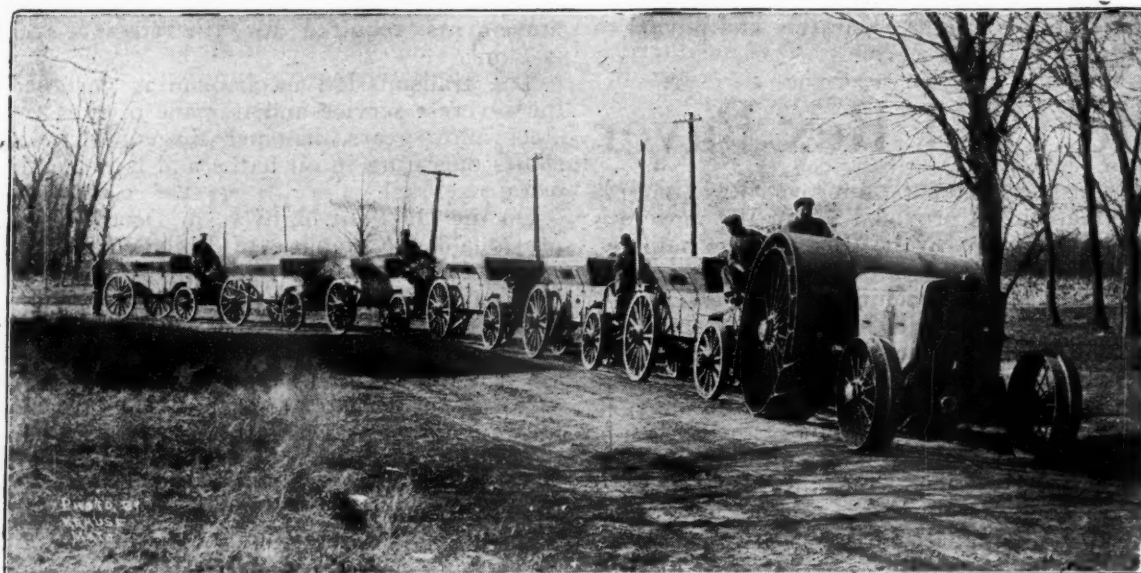
## Little Giant Tractor, Rotary Grader and Ditcher

The tractors made by the Little Giant Company are especially recommended for road construction service, great care having been exercised to design them for simplicity, efficiency and strength. They are made in two sizes, developing 16 and 26 draw-bar horsepower.

The brake is of the Automobile contracting foot lever type, handy to a driver's left foot, operating on outside of case in differential gear housing, a dust-proof case.

One of these tractors hauls a train of six dump wagons for Coochiching County, Minnesota, another hauls an 800-pound steel drag owned by the city of Owatonna, Minnesota. In Mankato a Little Giant tractor hauling a Little Giant rotary grading ditcher built 300 feet of street in forty minutes.

The Little Giant rotary grader and ditcher, con-



ONE OF FOUR LITTLE GIANT TRACTORS OWNED BY COOCHICHING COUNTY, MINNESOTA, HAULS TRAIN OF SIX DUMP WAGONS

They are operated with kerosene, gasoline, alcohol, naphtha or motor spirits. The power plant is a complete unit giving a short-coupled, straight-line drive that delivers 76 per cent of the motor power to the draw-bar. The oil system is a combination of force feed and splash system. The drive wheels are of heavy steel construction, each running on two sets of Hyatt roller bearings. The steering gear is of the automobile type with foot lever brake. All gears are of high-grade alloy steel and all castings are of high-grade semi-steel. When required, the tractors are furnished with extra equipment of Presto-lights with adjustable 10-inch locomotive-type reflectors, draftometer, air cleaner to remove dust, etc., from the motor, and drive-wheel extension rims that can be quickly attached to the drive wheels to provide additional traction surface.

The draw bar has a low hitch from in front of drive wheel axle, pulling through heavy coil spring in dust proof cylinder which prevents shock to tractor or its load, eliminating side draft by means of specially constructed rear draw bar guide.

The Magneto is high tension Kingston driven bl gear, with antikick device and impulse starter. Can crank motor with spark control open without personal danger. No batteries required.

The Governor is gear driven and extremely sensitive.

constructed on different plans from those hitherto used for road-building machines, first breaks the soil by a steel mold board and share plow mounted on front and rear wheels that guarantee light draft and smooth, steady operation. The loosened earth is deposited on a tilted revolving platform composed of hinged steel elevator cups that are carried to the opposite side of the machine and elevated by the dump wheel, which distributes their contents in an even, continuous stream on the road-bed at any desired distance from 5 to 10 feet from the plow.

The soil is moved the same distance whether the machine is operated on level ground or on the side of a steep grade, and regardless of the kind or condition of the soil. The machine leaves the road in a finished condition fit for automobile traffic without harrowing or dragging. Adjustment of depth or width of cut or width of discharge are easily and quickly made by the driver without leaving his seat.

The machine has a capacity of 200 to 300 cubic yards per hour and weighs about 4,000 pounds. It is efficient for making irrigation ditches and connecting laterals and for cleaning or rebuilding them.



## Case Tractors for Road Work and Heavy Hauling

Tractors manufactured by the J. I. Case Threshing Machine Company have been used with satisfaction for removing material from steam shovels, for heavy hauling, and for road construction operations, as is indicated by the following letters to the builders from some of the purchasers of the tractors which announce saving of 50 per cent in the cost of work done by them.

M. L. Jacobs, superintendent of quarries, Bethlehem Mines Corporation, writes:

Your dealer, Mr. Ruth, at Wernersville has asked us for an expression of opinion relative to the Case Tractors which we have recently installed at our Lebanon quarry, and which we are using to haul dump wagons on a quarry stripping operation.

We have had these machines in operation for more than a month and so far they seem to justify our expectations as to economical operation and satisfactory performance under all conditions. We find that we have been able to reduce our hauling cost approximately 50% and to increase the loads on the wagons. We also find that one tractor does the work of  $4\frac{1}{2}$  teams and does it under nearly all conditions of weather.

There are some days, after heavy rain, when it is necessary for us to take off one wagon, but under ordinary conditions we haul three dump wagons, each loaded with  $1\frac{1}{2}$  yds. of stripping dirt. We feel quite well pleased that we have gone ahead and installed these tractors, as results are so satisfactory in every respect that our judgment is vindicated. A great many people told us before we installed tractors that they would not do the work, but we are more than satisfied and believe the results speak for themselves.

Since installing the tractors, our stripping operation per yard has been just cut in two, which I believe is the final answer to any proposition of this kind.

Emory L. Johnson, of Isaac G. Johnson & Co., New York, says:

You doubtless will be interested to know our experience with one of your Case 10-18 tractors. We have had this machine in operation in our plant for the past two and one-half years and have been very much pleased

with it. The service in a steel foundry is severe and the tractor has performed well. Outside of the thorough overhauling which we gave it about six months ago, we have had no trouble to speak of. The rubber tires with which you supplied us are still on the machine and we expect a great deal more wear from them.

The major part of this machine's work is to haul slag and refuse material to our dump, although it is used somewhat around the foundry. I would say this has replaced the service of three teams and twenty laborers.

F. M. Goode, road engineer, says, under date of April 24, 1920:

The Levy Court of Kent County recently bought one of your 22-40 tractors for road work, and it has proved very satisfactory in every detail. With the tractor we are able to do at least twice as much work in a day as we could with a steam engine. We find it more economical, as it does away with hauling coal and water and is always ready to work.

## Pioneer Tractors

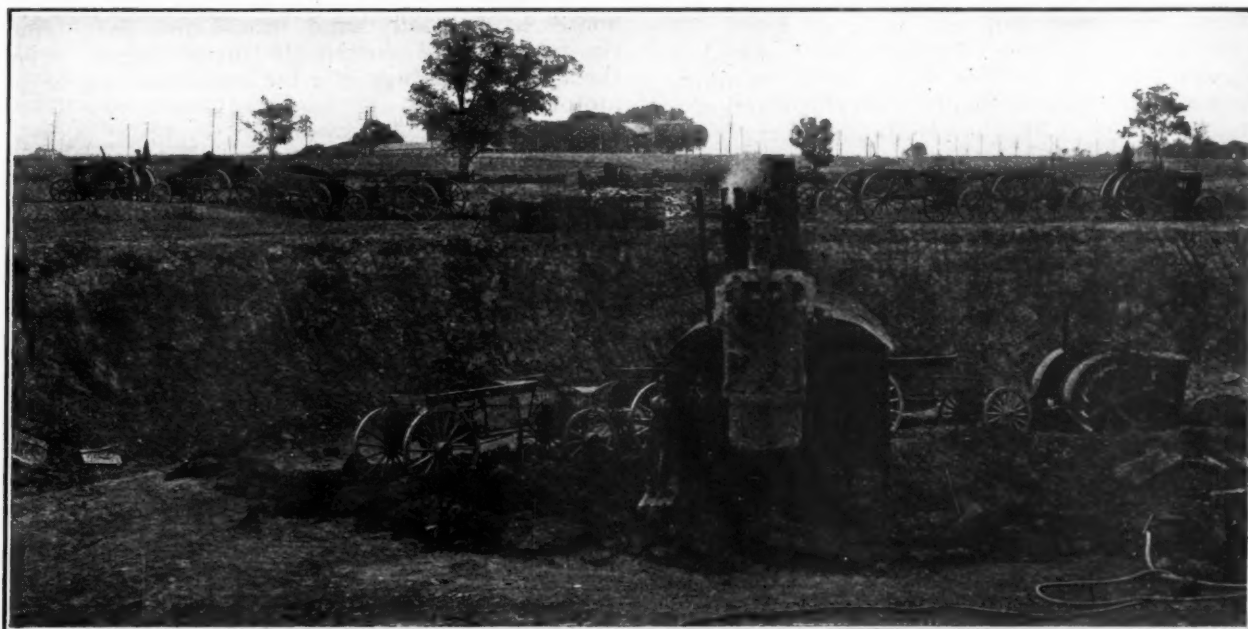
The Pioneer tractor, which has been used for road construction for several years, has recent improvements in the type known as the Pioneer 30-60, a large number of which are now being sold to counties and road builders for road work.

The tractor is equipped with a heavy-duty motor that develops 75 h. p. on the brake and 40 h. p. on the drawbar. This motor is very accessible and unusually free from vibrations.

The tractor has three speeds forward and reverse, with ample power for handling a 12-foot grader, any kind of road surfacer, or elevating grader. The tractor is used in pulling stumps and handling rock, etc., in the clearing of highways.

The drive wheels are 8 feet in diameter with 24-inch tires, with provision made for attaching an additional 12-inch extension.

A comfortable cab, containing all the operating levers, is provided for the operator, and is equipped with a regular automobile steering de-

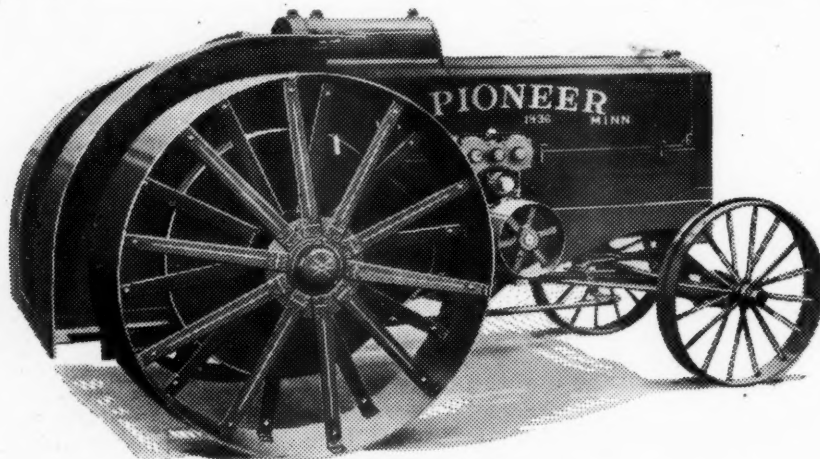


CASE TRACTORS DRAWING DUMP WAGONS IN TRAINS OF THREE, OUT OF STEAM SHOVEL PIT



vice, which makes steering of this big machine exceptionally easy. The machine has powerful traction for its weight of 24,000 lb.

After one of these machines had given a road building demonstration in Pulaski County, Missouri, the county purchased a machine, afterward another, and in 1920 purchased seven, which have been used for constructing a large amount of road work that would not otherwise have been built in that country.



PIONEER TRACTOR, SUITABLE FOR HAULING TRAILERS AND ROAD BUILDING MACHINERY

The Pioneer Tractor Company realized the demand for a light tractor with lots of power to be used for light road construction and road maintenance. With this type of engine in mind, they built what is known as their 18-36.

Counties and road builders have bought many of these engines and they seem to fill a long-felt want. Like the 30-60, this tractor has three speeds forward and reverse, with ample power for pulling an 8-foot grader, any kind of road surfacer, or drags. The drive wheels are 5 feet in diameter with 18-inch tires. All gears are cut from steel blanks, hardened and run in an oil bath. The journals are all equipped with Timken roller bearings, which cuts friction down to the minimum. The machine has unusually powerful traction for its weight of 6,200 lb. It handles very easily, being equipped with a regular automobile steering device, which permits it to turn in a circle of 12 feet radius.

## The J. T. Tractor

The J. T. tractor, built by the J. T. Tractor Company, has full crawler traction, thereby permitting it to work on hillsides, in swamps, and on any soft or irregular ground, also to turn in a short radius. The crawler shoes have a combined area of 1,628 square inches, reducing the 7,600-pound weight to the pressure of only  $4\frac{1}{2}$  pounds to the square inch.

The tractor has three speeds forward and one reverse, and its power is developed by a valve-in-head, full-force-feed lubrication motor with a  $4\frac{3}{4}$ -inch bore and 6-inch stroke.

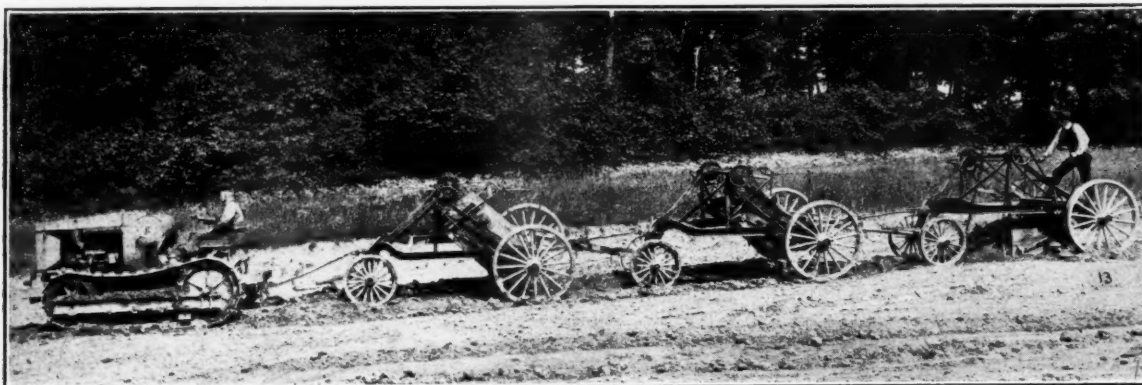
For road building it has made high records in handling scrapers, ditchers and three Maney graders in tandem. On the belt pulley it develops 36 h. p. to operate the sawmill, rock crusher, screen, concrete mixer and other equipment.

## Highway Trailers

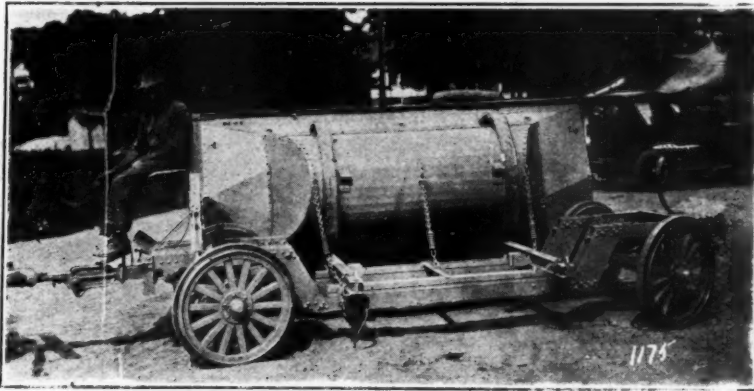
The two and four-wheel trailers of 1 to 10 tons capacity that are manufactured by the Highway Trailer Co. have been used to great advantage in the construction of the 100 miles of large concrete aqueduct recently completed for the water supply of Winnipeg and adjacent towns.

A fleet of six 6-ton four-wheel reversible trailers, equipped with 3-yard two-way steel dump bodies hauled daily sand, gravel and dirt. The equipment paid for itself many times over through the savings effected in connection with motor trucks.

A new type of trailer chassis equipped with a two-way steel dump body is suitable for hauling garbage, ashes and other city refuse. This is also a unit that can be used by contractors for haul-



J. T. TRACTOR, OWNED BY McLINDEN & DUNNE, CANTON, O., MOVES 60 YARDS OF EARTH 800 FEET PER HOUR WITH CREW OF TWO MEN, REPLACING FIVE MEN AND SIXTEEN HORSES



HIGHWAY TRAILER WITH DROP FRAME AND TANK

ing sand and gravel. The body, when mounted on the trailer, has a loading height of 60 inches from the ground, thus making the loading an easy matter.

This trailer is also furnished with a tongue equipment, making it possible to use teams in the collection of garbage and ashes. The trailers are gathered at some central point and are carried to destination in trains of four or five trailers by a motor truck or tractor.

## Holt Tractors for Road Work and Snow Removal

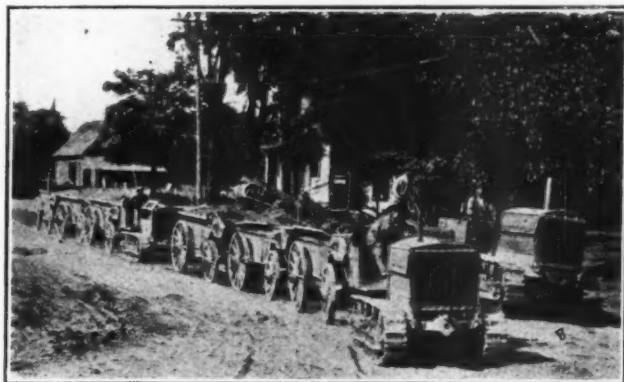
Caterpillar tractors made by the Holt Mfg Company are used in road construction for hauling trucks and trailers and for heavy snow removal work.

A convincing demonstration is afforded by the use of 5-ton and 10-ton tractors employed by S. M. Timberlake, Indianapolis, for grading the Keystone road, where they were used not only to haul the elevating grader machine, but also to pull trains of loaded dump-cars moving continuously alongside the grader at the same speed and receiving and disposing of the excavated material. The two 5-ton tractors actually replaced six team each. They hauled the dump-wagons in trains of three wagons each, one train being loaded while the other train was hauling away spoil and returning ready to serve the grader as soon as the other train was loaded.

On a road contract executed by H. H. Hannenkrat, Kansas City, Mo., cuts and fills were made by a caterpillar land leveler hauled by a 10-ton caterpillar tractor. The land leveler operated by one man carries and distributes the dirt, replacing six men and teams with slip scrapers or blade graders. The tractor and leveler with two men can move from 300 to 500 yards of earth 500 feet in ten

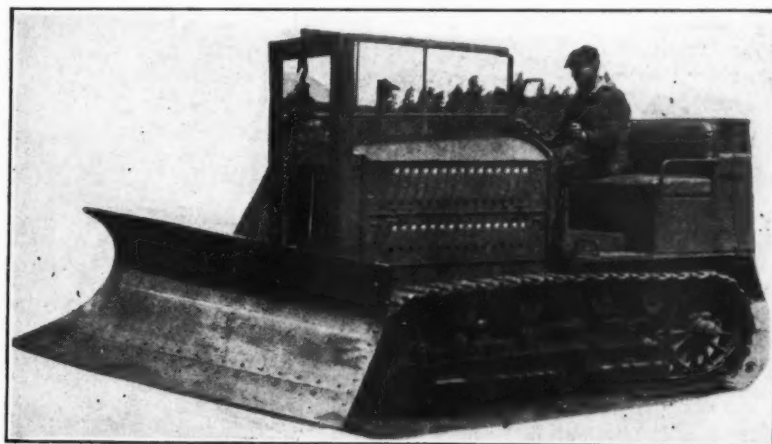
hours. A smaller size leveler hauled by a 5-ton tractor will move from 200 to 300 yards of earth with two men in ten hours. Caterpillar tractors may be equipped with a winch mounted on the front of the machine, which is found useful for a great variety of construction operations and is particularly valuable in logging work, where it is a great labor saver in snaking logs out of deep water, towing rafts and operating lines in places where other power is not available.

The ability of the caterpillar tractor to go anywhere, over deep



S. M. TIMBERLAKE, INDIANAPOLIS, REPLACED 12 MEN AND 12 TEAMS WITH TWO 5-TON HOLT TRACTORS AND TWO MEN

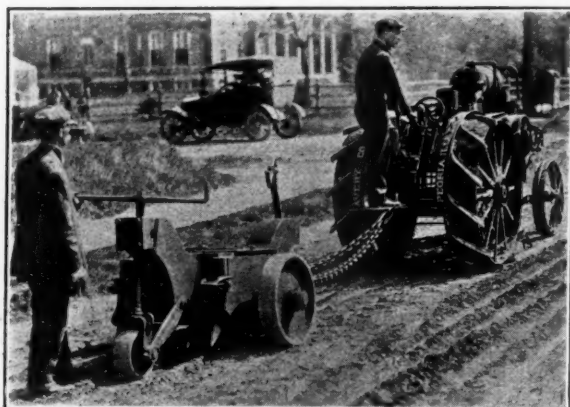
snow drifts or on asphalt streets and still maintains a positive footing for traction makes it very successful for snow removing operations. A 5-ton caterpillar tractor equipped with a blade type plow is especially adapted for clearing town and city streets of snow, moving it to the curb or into manholes. When equipped with a locomotive type plow it is suited for opening deep drifts on country roads.



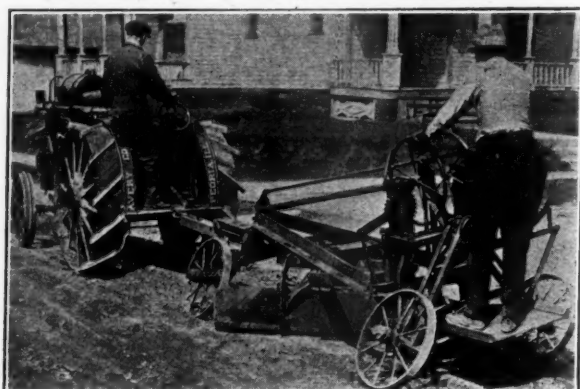
HOLT TRACTOR WITH SNOW PLOW ATTACHMENT ADJUSTED FOR USE

## Avery Road Tractors

The Avery special tractors, designed for road work and built by the Avery Company, are made in five sizes, 12-25, 14-28, 18-26, 25-50 and 48-80 h. p. They are equipped with patented sliding train transmission and with a motor that burns kerosene or distillate. They are provided with



8-16 H.P. AVERY TRACTOR HAULING SCARIFIER AT WEST LAFAYETTE, INDIANA



8-16 H.P. AVERY TRACTOR HAULING SMALL BLADE GRADER AT WEST LAFAYETTE, INDIANA

a special draw-bar hitch made of angles that enable them to be attached to a grader or other road machine in any position. They may also be equipped with a special road roller 32 inches in diameter with three, four and five sections 13½ inches long.

Among the principal advantages claimed for the tractors are the even distribution of weight between front and rear wheels, unusual power and economy, accessibility and simplicity of parts, a short

turning radius and great reliability and durability. The tractors are efficient for hauling trucks, wagons, scrapers, grading machines, drags, scarifiers, planers, levelers and other road-building machinery, single and in multiple.

J. C. Miller, commissioner of Dallas county, Texas, writes: "For the 37 days the tractor has been operated, 56 miles of road has been graded at a cost of \$444, which, under the old method, would have been \$2,800. We have reduced the cost of road grading to less than one-sixth of what it was formerly." J. S. Yeager, Putnam, Texas, says: "As to building roads, we can build them for less than one-third what we could do the same work with mules and much better. We can build roads for about \$15 per mile against about \$60 with mules."

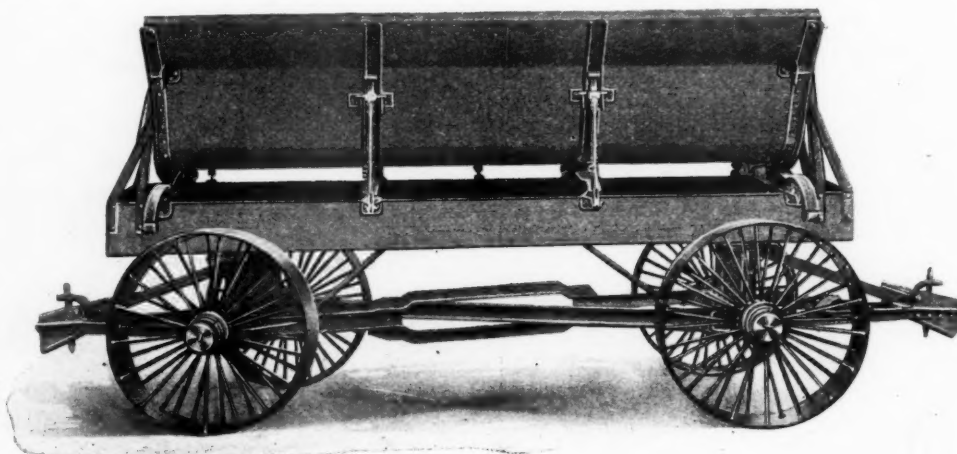
## Electric Tractor Trailers

Bulletin 70 of the Electric Wheel Company illustrates and describes heavy-duty, reversible, all-steel trains for general, industrial and highway transportation with slow-speed tractors designed to meet the demands of highway transportation with high-powered pulling units over good and bad roads. Especial attention has been paid to securing perfect tracking, easy coupling at any angle, reversing of each and every trailer without change of couplings, improved draw-bar springs, convenient lubrication and dust-proof roller bearings.

The all-steel cross reach construction was designed and built especially for severe demands of train use with traction engines and is fully revers-



BRAKE WHEEL, EASILY ACCESSIBLE FROM SIDE OF ELECTRIC TRAILER



ELECTRIC REVERSIBLE ALL-STEEL SIDE DUMP TRAILER



ible on either straight or curved lines. Bolsters are approximately flush with outer edge of tires and have at each end a large hole for chain binders. The brakes are operated by hand wheels on the sides of the trailers.

They are made in five sizes of 6, 8, 10, 15 and 20 tons capacity, weighing, respectively, 4,000, 4,400, 5,300, 6,000 and 7,000 pounds. The wheel base varies from 12 to 16 feet and the track, center to center of tires, from 5 feet 9 inches to 6 feet, according to size of trailer. The trailers are made with full or skeleton platforms or with complete bodies, as ordered.

They can be hauled in trains of any length on any roadway that is wide enough for the tractor itself because each trailer will follow exactly in the tracks of the tractor regardless of the number of turns.

Referring to this important feature in answer to an inquiry by the editor, the Electric Wheel Company writes:

"Concerning the trailing qualities of this trailer, would advise you are entirely correct in assuming that when the tractor makes a right angle turn every trailer will make the turn at the same point, that is, every wagon will turn the corner in the exact track made by the first trailer. This is due to the coupling and steering mechanism and is worked out to accomplish that result, making it possible for the tractor driver to proceed with his train without any anxiety as to the train following, knowing that the train will follow wherever he has driven his tractor. He need give no attention whatever to steering the trailers in the train."

Side dump trailers are built of 3½ and 5-yard capacity (5 and 7 tons), weighing 4,400 and 5,900 pounds, respectively, of all-steel construction. The body dumps by roller motion entirely by gravity, without complicated power devices for tilting or lifting, when the locks are released, and easily rolls back into position when empty. The 3½-yard body is 9 feet long, 6 feet wide and 85 inches above the ground. The 15-yard body is 11 feet long, 6½ feet wide and 88 inches high.

For use with smaller tractors, there is supplied a 4-ton, all-steel, reversible trailer possessing most of the qualities described for the heavy-duty trailers. These can be provided with bodies having an A-shape bottom and long sides hinged at the top, allowing the load to be dumped by gravity on both sides when the locks are released.

For occasional heavy hauling, the tractor wagon with solid steel axles and steel pipe reach 16 feet long, with swivel coupling adjustable to different lengths, is recommended. It is made in five different sizes of 6 to 20 tons capacity, those up to and including 10 tons being equipped with combination tongue for team or tractor, and the heavier ones with a tractor tongue. The bolsters and some other parts of the framework are made of selected oak, heavily reinforced. A similar wagon, but of all-steel construction is for use with a tractor where trains are not desirable.

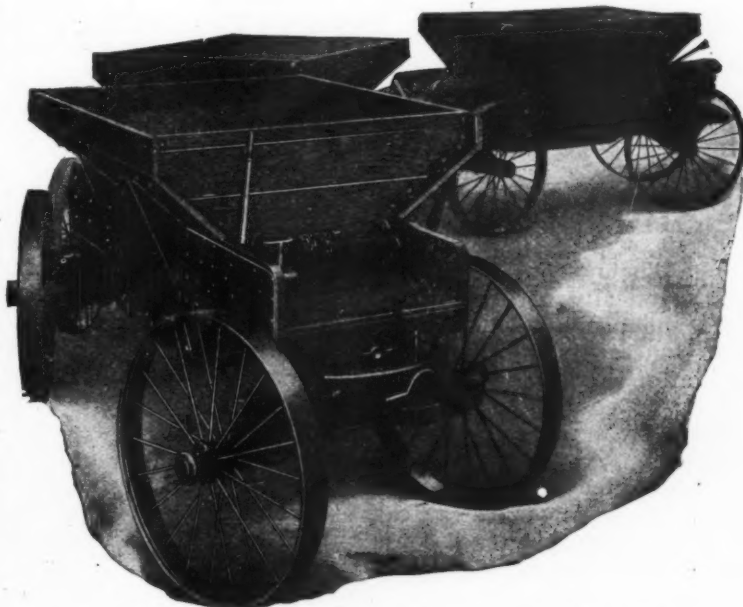
The heavy-duty tractor logging wagon, intended for use singly where trains are not advantageous, is made of steel and selected oak heavily ironed and has solid steel axles and adjustable length steel pipe reach 16 feet long. The weights are from 2,400 pounds for the 6-ton size to 7,500 pounds for the 20-ton size.

## Eagle Glen Trailers

The Eagle Glen trailers, manufactured by the Eagle Wagon Works, successors to the Glen Wagon & Car Corporation, have been built for five years and have been constantly improved in accordance with the experience gained in trailer service in England, France and Germany which has enabled the builders to perfect a practical, well-built, flexible equipment that stands hard usage and gives satisfaction with little repairs.

The trailers are of both light and heavy construction, in numerous patterns for different kinds of service. The sizes include 1-ton, 2-ton, 3-ton and 5-ton chassis, the heavier ones being of 2-way reversible construction. They weigh from 1,020 to 4,000 pounds without platform or box.

There are also semi-trailers of 2, 4 and 6-ton capacity, that are made with skeleton platform or with a semi-dump box, the latter being adapted to speed of 8 to 10 miles per hour when loaded. The Model D 2-way bottom dump trailer is designed for handling crushed stone, earth, coal, sand or gravel and is provided with two bottom doors released by pulling a lever or kicking a trip. It has forged steel wheels with drawn steel hubs, similar to the wheels on Model S, which is constructed with inclined steel doors hung crosswise on the body of the trailer, which hoist upwards inside of the body underneath steel shields that protect them from the material carried. They are raised and lowered by worm gears operated by bevel gears and are controlled independently.



MODEL D, TWO-WAY EAGLE GLEN BOTTOM-DUMP TRAILER

They can be raised or lowered to dump the material in a layer from 3 to 14 inches deep.

Model L is a 5-ton logging trailer with reversible cross reaches turning all four wheels simultaneously. The steel wheels have double sets of dovetail spokes.

The Model A roller bearing steel trailer is intended to carry coal, sand or gravel and has a hard-wood box with bottom dump doors.

Various types of bodies, racks, stakes and sides are provided for different services. The No. 4 body, with 3-yard capacity, is divided into six pockets covered with removable apexes which, with the division boards, can be removed if necessary. Each pocket can be dumped separately through side doors hinged at the top and are very useful for highway repair work.

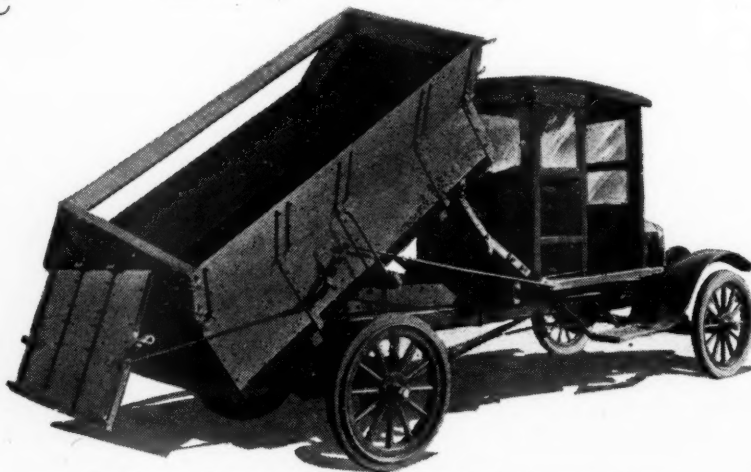
## Jennings Automatic Dump Bodies

Patent truck bodies made by the Jennings Automatic Dump Body Co., Inc., are independent units applicable to any make of truck, to the sub-frame of which they are secured by four U-bolts. They are made of the best grade of oak, strongly ironed, and lined throughout with 20-gauge sheet steel. They are provided with an automatic tail gate, automatic lock and dumping lever that requires only 30 pounds pressure to handle a 2-ton load. The body is securely held in position by a

spring catch which must be released before the load can be dumped.

When ordered, the bodies may be equipped with convertible tail gate, special operating devices or asbestos lining. They are manufactured in 1, 1½, 2 and 3-ton sizes, adapted for hauling building materials, crushed stone, cement, gravel and other materials.

The Jennings automatic dump body for hauling garbage, street cleaning refuse, and other materials of light specific gravity, has a capacity of 85 cubic feet and may be made from the standard 1-ton body by additional parts removed from it in a few minutes. The combination permits the body to be used for hauling light material or, with the additions removed, for hauling heavy material. It is constructed to allow the sides to be lowered for loading purposes and has a tail gate which may be operated automatically, providing a large opening so that the garbage can be dumped directly into the incinerator.



JENNINGS AUTOMATIC TAIL GATE AND HINGED SIDES

## Steam Shovels

### Thew Shovel Improvement

The Thew Shovel Company announces that it has practically revolutionized the whole procedure and product within the past two or three years, one of its chief objects being the standardization of the product and complete interchangeability of equipment and parts. The Type O shovel, the standard machine, has been adapted for much heavier work. The company's engineering department has worked out a combination of two types of trucks, the all-cast steel and the all-structural steel, the truck containing a heavy center casting reinforced and supported on one side by double I-beam structures. The whole frame is held together by through bolts and tie-rods, permitting tightening to be done in the field with an

ordinary heavy wrench and replacements to be made at a minimum of expense. The makers believe that this type furnishes solidity and strength combined with the necessary resiliency.

The turn-table, which is mounted upon the truck and which carries all the mechanism and all the super-structure, is built up in a manner very similar to the truck. Mechanism for either steam, electric or gasoline operation can be applied and all are interchangeable.

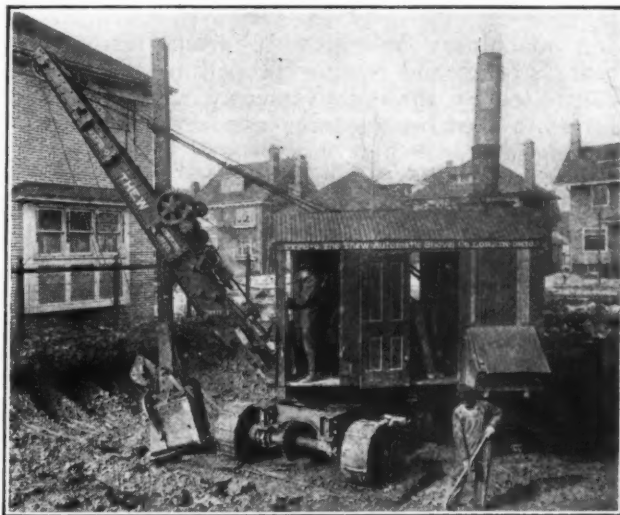
The engines have been redesigned with increased bearing surface on wearing parts and slightly increased power in the case of the swinging and crowding engines. The main friction clutch, which operates the hoist drum, is now both released and engaged by means of a steam-operated ram instead of by hand. The turn-table has been so arranged that at any time the machine can be equipped for clam-shell, bucket, or crane service.

Another improvement is a new boom built in the form of a plate girder and so shaped that its center of gravity is nearer the base than in any other boom built, this giving a greater stability to the whole machine and therefore increased digging ability without increase in weight.

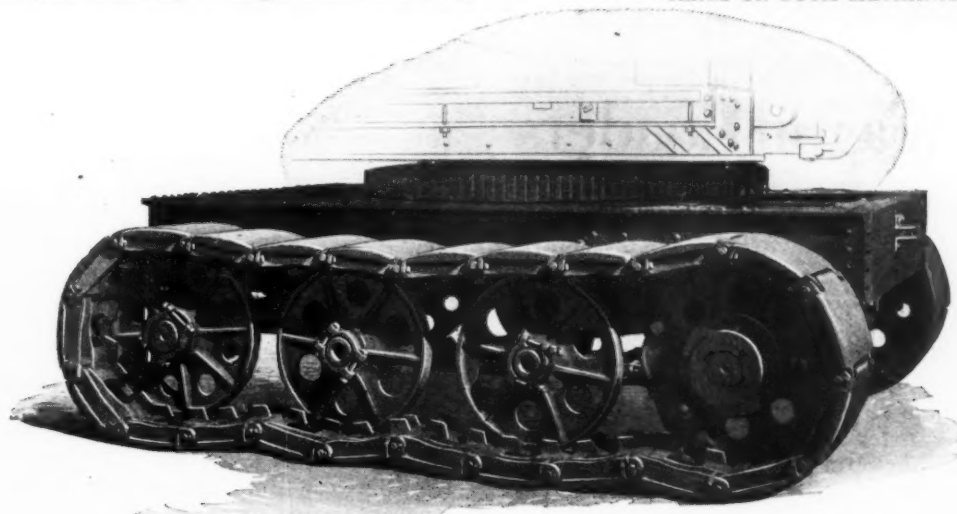
One of the most important minor features of the new design is the substituting of cut gears for cast steel gears in every instance except the large rotating gear upon the truck frame and the pinion which meshes with it.

## Bucyrus 30-B Universal Shovel

This new steam shovel, manufactured by the Bucyrus Company, embodies new features designed to enable it to be used as a revolving shovel, a sewer shovel, a high-lift revolving

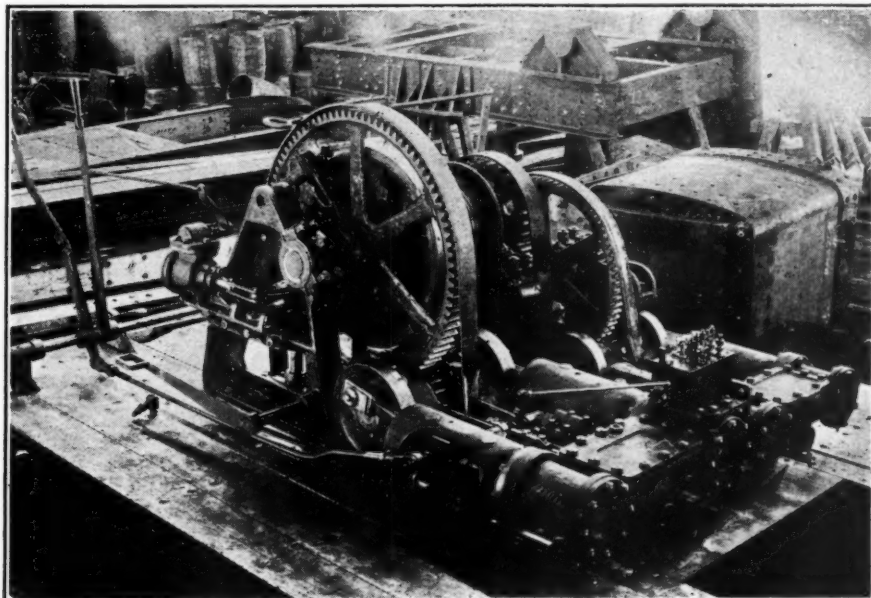


THEW SHOVEL, SHOWING PLATE GIRDER BOOM WITH SINGLE MEMBER DIPPER STICK; DOUBLE REDUCTION GEARS ON BOOM MECHANISM



BUCYRUS DIRECT GEARED CATERPILLAR TRACTION WITH CAST STEEL TREADS

(For other uses of the Bucyrus Shovel, see the first article in this issue)



LAYOUT OF THEW MECHANISM ON TURNTABLE  
(Steam ram at left, engines at right. Shows cut gears)

shovel, a drag-line excavator, a clam-shell excavator, or a crane with the minimum additional parts. These features have been acquired without any sacrifice of power or without limiting the functions of machinery designed solely for either of the above purposes. The shipping weight varies from 5,300 to 6,000 pounds, according to the mounting for railroad, traction or caterpillar trucks.

Among the important features are the heavy truck frame, the dipper handle composed of two members straddling the boom with long racks that may be reversed to increase the wear, double cylinder reversing engine, machinery for operating different services without material change, swing-



ing machinery mounted in front instead of rear, strong and simple propelling machinery, controlled by three conveniently arranged hand levers, a foot brake, a reverse lever and a propelling lever.

For drag-line operations the machine is equipped with a 1-yard bucket and 35-foot boom or a  $\frac{3}{4}$ -yard bucket and 40-foot boom, and with an additional drum, brake, clutch and thrust cylinder operating levers, boom, sheaves and bucket.

The same changes, with the exception of the additional drag-line trolley, high-speed propelling gears and heavy hook and block are provided, giving it a capacity of 9 tons at 20-foot radius.

The same additions, with the exception of a clam-shell bucket instead of a hook, transform the machine into a clam-shell excavator with a 1-

yard bucket and 35-foot boom or  $\frac{3}{4}$ -yard bucket and 40-foot boom.

For sewer excavation there is required a  $\frac{3}{4}$ -yard dipper with 30-foot handle good for a 20-foot trench or a  $\frac{3}{4}$ -yard dipper with 24-foot handle good for a 14-foot trench.

Used as a high lift shovel there is required a long boom and long dipper handle with longer ropes.

This company is said to be the first to mount heavy excavating machinery on caterpillar traction, and recommends such traction for almost every condition. The 30-B may also be mounted on traction wheels or railroad trucks of any gauge from 5 feet to 3 feet 3 inches. The several mountings are readily interchangeable.

## Conveyors and Loaders

### Haiss Wagon Loaders

Wagon loaders made by the George Haiss Mfg. Co., Inc., are used by road contractors, quarry companies, sand and gravel dealers and others for handling loose materials. They have an adjustable inclined framework mounted on a truck that carries the motor and driving mechanism. The lower end of the conveyor is equipped with a transverse shaft carrying propeller blades that dig and transfer the materials automatically to the elevator buckets. At the upper end of the conveyor there is an adjustable cantilever chute that delivers into the adjacent car, wagon or truck. With this machine 5-yard trucks can be loaded with crushed stone in 5 minutes at a cost of  $2\frac{1}{2}$  cents for power. The machine is driven

by a 10-h. p. electric motor or gasoline engine.

The same company manufactures a similar wagon loader without the propeller blade digging shaft, that can be driven by a 5-h. p. motor. It also makes a bag-loading machine which can be driven by a motor operated by electric current, gasoline, kerosene or distillate.

A self-propelling machine owned by the Phoenix Land & Improvement Company, Paterson, N. J., was operated at the rate of 1 yard per minute at a cost of 1 cent for power. To do the same work by hand it would have required 5 or 6 men 25 or 30 minutes to load a 5 cubic yard truck with material.

Another machine used by the Union Building & Construction Company, Passaic, N. J., delivers and reclaims crushed stone to and from the storage reserve pile, thereby enabling the crusher to run continuously at the company's quarry. Sim-



PATH DIGGING WAGON LOADER, DIGGING 1 YARD PER MINUTE WITH ONE-MAN CREW

ilar machines are being used for digging gravel and loading it into automobile trucks in the Panama Canal zone and some are now used for digging sand in the Ganges river in India, in Cuba, Japan and other foreign countries where labor is much cheaper than in the United States.

## Mathews Gravity Carriers

For unloading cars or in paving, the carrier reduces cost of labor and reduces chipping. It eliminates the wages of four or five men in handling 35,000 to 40,000 bricks a day in street paving. The Mathews Gravity Conveyor Co. furnishes the following data of specific cases illustrating the special value their standard gravity roller conveyor.

Roehl Brothers, contractors, of Cleveland, O., write:

We have long since wiped out the old practice of using wheelbarrows to place brick for the pavers, and we are using gravity carriers (Mathews type) exclusively. We would not think of going back to the wheelbarrows.

In our operations we use two sections of carriers. By using four men to each section (two men placing bricks on the carriers and two men taking bricks off and placing them for the setter), it is no trouble to handle 40,000 bricks in an 8-hour day. If we were to handle the same amount of bricks by the old wheelbarrow method we would have to use four men in addition to the number required to operate with the carriers this necessitating twelve men where we now do the same amount of work with eight. As far as adroitness is concerned, we find it is impossible to do good work without skilled help. The men who are taking off the brick and setting them must be good brick handlers, which we consider skillful. The men who are putting the brick on the rollers must also be good brick handlers. We find it takes good men to do good work.

It also can be noticed that the carriers have helped to reduce the number of culls, such as broken and chipped bricks, which always happens when dumping the brick from the wheelbarrows, thus saving a number of good bricks that would otherwise be culled out because they are chipped. The men also appreciate the carriers in the fact that setting brick with the carriers is less tiresome

by far than the old wheelbarrow method.

With the labor troubles that contractors are experiencing at the present time and without any relief in sight, a saving of four men is a big item, and with the very wide margin that the price of labor has, one can easily see if the price of labor keeps on advancing, the saving in the use of gravity carriers will keep increasing. Our data as to saving are shown below, figured on an 8-hour basis, in which we handled 40,000 bricks.

### WITH MATHEWS GRAVITY CARRIERS

|   |         |
|---|---------|
| Two men putting bricks on rollers at \$2.75 per day     | \$5.50  |
| Two men taking bricks off and setting at \$3.00 per day | 6.00    |
| Two sections  | 11.50   |
|   | \$23.00 |

### WITH WHEELBARROWS

|  |         |
|--|---------|
| Nine men wheeling at \$2.75 per day        | \$24.75 |
| Three men setting bricks at \$3.00 per day | 9.00    |
| Wheeling cost                              | \$33.75 |
| Carrier cost                               | 23.00   |
| Saving per day                             | \$10.75 |

According to John R. Kennedy, of C. Kennedy & Son, Parkersburg, W. Va., this same gravity conveyor not only reduces the cost, but actually cuts down the percentage of chipped and broken bricks.

"We can handle bricks much more economically with the Mathews than was possible by the old wheelbarrow method," says Mr. Kennedy, "as it requires only about one-half the number of laborers. In using the wheelbarrows it was necessary to have two gangs, one wheeling and one setting up the bricks to the bricklayers. With the use of the Mathews carrier the wheelbarrow gang is eliminated and the brick is delivered to the layers in better condition, that is, not chipped or broken. With two good bricklayers and 10 or 12 laborers we can lay 50,000 bricks per day by handling the bricks over the Mathews carriers."

If the opinion of a large user is of any greater weight than that of any other experienced person, the testimony of the Stamey-Mackey Construction Co. should be important. This concern has been handling a large quantity of bricks with the gravity system, having in use eight or ten sec-



DELIVERING BRICKS FROM BOTH SIDES OF STREET TO PAVING GANG



tions of Mathews gravity carriers. Said Mr. Stamey, in speaking of the efficiency methods he employed:

Our carriers are all in the 8-ft length so that they will fit various widths of streets.

Unless the street is exceptionally wide, we use one set of conveyors to each man setting. We find that better time is made by having the brick setters divided up, using several gangs of this kind, than is made with more than one setter or layer to each conveyor. Of course, if the street is 40 feet or more in width, then we use two setters. For a narrower street where we are using two or three sections 8 feet long, we use one setter, two men taking bricks off the conveyor and setting them in place for the setter and two men taking them from the pile along the curb and putting them on the conveyor.

A gang of this size will set 600 yards of 3-in. vertical-fiber bricks or about 20,000 bricks, in 8 hours. Before using the conveyors, we had 7 men with wheelbarrows for each setter. The chief disadvantages with wheelbarrows were in shipping bricks and displacing the ones already laid. If I were a brick manufacturer, I would insist that the contractors use these conveyors, as they save many a brick on a year's work.

A slightly different method of using the conveyors is carried out by Stipes & Pilcher, of Champaign, Ill. Writes Edw. S. Pilcher of that company:

We do not handle bricks off the parking, but take them off the wagons instead and lay them directly in the street. We commence laying bricks at the end of a street or intersection and then place 2 x 12-inch boards for a track to run our loaded wagon on so as to bring them at all times up to the brick laying. In this way, we only handle our bricks once.

On each side of the wagons we use a 16-ft. carrier and have two men putting the bricks on each carrier and two at the other end, stacking them for the brick setters. Our average is 35,000 bricks in a day, all of which are handled with the carrier, and it takes eight men to put them on and take them off. We are not compelled to handle the bricks so many times, and in muddy weather the bricks come to the setters clean and the men are not tracking mud in on the new bricks before the filler is poured. We always have the right number of bricks at hand where, if they are stacked on the parking, in some places you are a few short or have some left to pick up when the job is finished.

The Mathews gravity brick conveyors referred to by these contractors are all-steel ways provided with rollers over which the bricks are carried by their own weight to the setters. They are easily moved on casters, which are provided, and are built very strongly to stand the hard usage they are sure to encounter.

#### LOADING TRUCKS FROM CARS

Mathews gravity carriers have also proven economical in the loading of motor trucks from cars. In unloading cars it is customary to use three 4-foot sections and a 90-degree curve inside the car. If the packages are loaded direct into a truck, a connecting section either 4-foot or 8-foot long is necessary to run out into the truck. The principle is the same, however, for all purposes. When first starting to unload a car direct into truck, it is simply necessary to rest the first unit on the sill of the car. When an opening is created the 90-degree curve is added which may be pointed in either direction. As the work of unloading the car proceeds additional 4-foot units are added, as needed, until one end has been emptied. Then the three units are detached, the curve reversed, and operation repeated. When loading from truck into car the direction of travel is simply reversed and the same steps are followed. The full line is

used to start with and gradually shortened up as the car is filled.

A paving contractor who has adopted the above method of car unloading explains his method as follows:

When unloading cars of bricks into trucks, first place a standard 8-foot section of conveyor from edge of car door into truck, backed up to car at right angles. This will run the bricks up to the front end of the truck. As soon as an opening has been made a 90 degree curve should be attached to the car end of the 8-foot section. Then three 4-foot sections are added to the car, as needed, to keep the loading end near the bricks at all times. When one end of the car is empty, reverse the curve and repeat the operation. If common bricks are handled exclusively we recommend an 8-inch, which handles two bricks abreast. To obtain the best results the conveyor line should be filled from end to end and crosswise, so that when bricks put on at the loading end the same number must be taken off at the discharge end.

J. B. McAuley, Galesburg, Ill., contractor for sewers, pavements, brick masonry and general construction, writes:

We use the Mathews Gravity Carriers for unloading bricks from cars to wagons and we estimate a saving of about 15 per cent. over the method of carrying such brick or blocks with brick clamps; this does not include the saving in team time, which is reduced from 10 to 12 minutes to 7 or 8 minutes for loading each load.

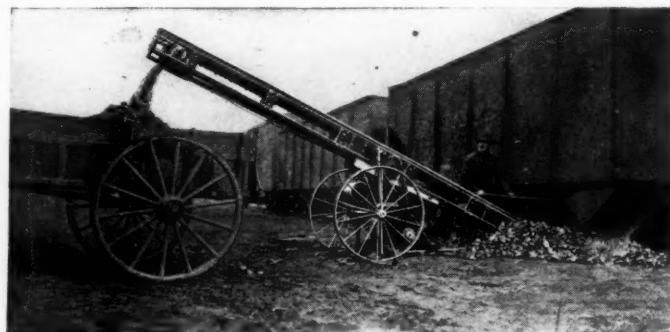
We also use the Mathews Carrier for conveying the bricks from piles along street to the brick setters; the carrier is mounted on swiveled caster supports, which can be moved in any direction promptly; with this machine this operation of transferring the brick or blocks from piles to brick setters, we estimate a saving of 20 per cent. of the labor cost, to say nothing of the saving of broken corners, etc., on bricks handled by the wheelbarrow method.

## The Scoop Conveyor

The conveyors made by the Portable Machinery Company for loading and unloading sand, gravel, broken stone, coal and other materials are built in 14, 20 and 24-foot lengths, and in two widths, making six different sizes.

They have an adjustable inclined framework with an endless conveying belt perfectly balanced on a pair of wheels that support its electric driving mechanism. The distinctive feature is the scoop end that can be pushed or completely buried in the material to be conveyed, allowing the material to be scraped onto the carrying belt instead of shoveled into a feed hopper and thus saving about 50 per cent of the labor of feeding.

The belts are provided with low or high trans-



SCOOP CONVEYOR LOADING WAGON WITH BROKEN STONE FROM DUMP CAR



verse cleats, according to whether the materials handled do or do not roll readily.

These machines can unload a car at any point along the track without requiring a pit or track hopper. With it one man can unload a 50-ton car in one hour under the most favorable conditions and in from two to three hours under ordinary conditions. Where the material has to be elevated higher than the reach of the machine, two or more machines can be set tandem, delivering from one to another and carrying the material to the required height without hand labor.

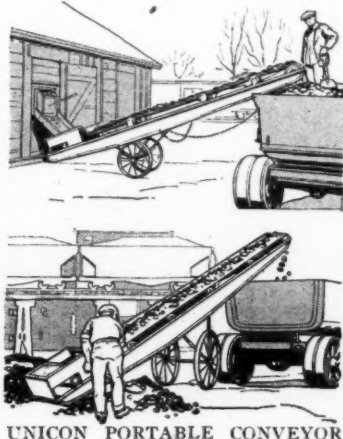
A 24-foot machine will load an open-top car with sides up to 11 feet in height. One man can load a 3-ton truck in a minimum of three minutes and an average of five to ten minutes. The carrying capacity of both the 12-inch and the 16-inch wide conveyors is 1 ton per minute. The belt speed is 140 to 180 feet per minute. Shaft bearings are selfaligning bronze filled with graphite. Any size conveyor can be transported on a 1½-ton truck. The total weight of a 12-inch by 20-foot machine with motor is about 1,100 pounds. They are equipped with either electric or gas-line engines.

The city of Highland Park, Michigan, writes that it has used the scoop conveyor for elevating sand, gravel and crushed stone at the rate of 1 yard per minute with two men shoveling. For unloading sand and stone from hopper-bottom cars, the cost was reduced 300 per cent.

The Pendelton Mfg. Company, Autun, S. C., writes that in unloading coal from car to truck the conveyor saved half the cost of hand shoveling. Marcus S. Wright, So. River, N. J., dealer in sand and clay, "can load from 150 to 175 tons in a 9-hour day" with half the labor required for hand work.

## Unicorn Portable Conveyor

The Unicorn is a powerful, light-weight, self-contained, portable conveyor built by the Stephens-Adamson Mfg. Co. for handling bulk material at low cost per ton. This machine will



UNICORN PORTABLE CONVEYOR

handle sand, stone, gravel, coal, coke, ashes, brick, tile, bags and other materials for elevating and loading into trucks, buildings or other purposes.

The Unicorn is manufactured in four standard lengths, namely, 15, 20, 25 and 30-foot centers, and is equipped with an 18-inch high-grade rubber conveyor belt. Each machine is furnished with an individual electric driving motor which is securely mounted within the steel plate girder type frame. When equipped with the S-A wire wheel truck and hoisting rig, the Unicorn can be easily moved from place to place and the carrying angle can be quickly raised or lowered.

The manufacturers of this machine also supply safety car pullers of 7½ h. p. that develop a rope pulling capacity of 4,000 pounds at a speed of 30 feet per minute.

## Galion Stone Unloader

The portable and stationary unloaders built by the Galion Iron Works & Mfg. Co. are of wood or steel, of 5 to 50 tons capacity. The machines are designed for unloading stone, sand, gravel and similar materials from a hopper-bottom car, carrying them to a bin and loading them into a truck or wagon without the employment of hand shovellers at any time. The essential parts of the machine are the frame, hoisting apparatus, bin, chute, pit, and power plant.

The unloader is first located at the siding, where the cars are spotted with the hoppers or slides over the depressed chute through which the materials are discharged into a bucket in a pit



50-TON GALION UNLOADER ELEVATES AGGREGATE TO STORAGE AND DELIVERS BY GRAVITY TO TRUCKS

between the unloader and the railroad track. The loaded bucket is hoisted up an inclined track to the top of a hopper bin, into which it is dumped. The contents of the bin are discharged by gravity into wagons, trucks, or cars alongside. To remove the unloader from one location to another, its inclined track is hoisted from the pit and folded; the tower is demounted and lowered; the side sections of the bin are lowered; trucks are placed under the bin frame, and the bin posts are raised on their hinges, permitting the unloader to be hauled away by trucks or road roller.

Steel unloader bins are made of 5, 15, 25 and 50-ton bin capacities. Wood unloaders are made of 18, 50 and 125-ton capacities. The unloader will handle from 500 to 600 tons of stone per day. A safety device is provided by which the opening under the track can be automatically closed as soon as the car is empty, thus conforming to the strictest railroad regulations.

An unloader used by the Hezlep-Seaton Company, Dayton, Ohio, handled material at a cost of not more than 3 cents per ton, effecting a saving of 15 cents per ton over hand methods. On a 6-mile concrete road job, one of these machines was estimated by T. P. Fitzgerald, contractor, to have saved \$25 a day for 100 days.

The board of commissioners of Monroe county, Michigan, state that the unloader will pay for itself in "handling the material for two miles of stone road 10 feet wide and 9 inches thick."

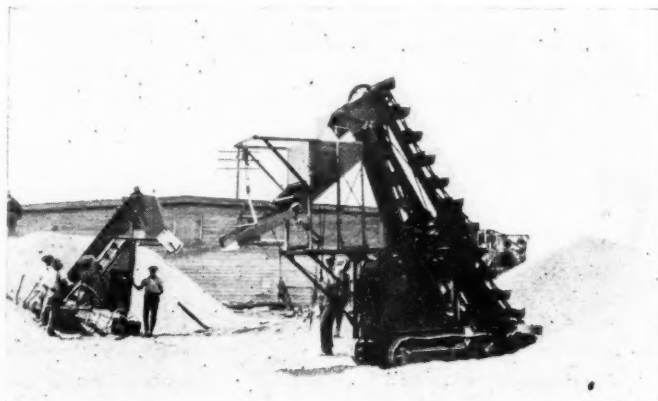
With one of these machines a boy employed by H. F. Ault & Son, Cardington, Ohio, unloads 3 cars, or 120 cubic yards of stone, for a cost of 2 cents per cubic yard for labor, gasoline and oil.

The Galion Imperial portable screening plant has a 4-compartment 20 or 30-ton wooden storage bin mounted on an elevated frame and equipped with a collapsible bucket elevator; an incline revolving, overhead screen, and four high discharge chutes. The mechanism is operated by a 6-h. p. enclosed gasoline engine. Under ordinary conditions the elevator will deliver 50 to 60 cubic yards of screened stone per hour. For transportation it is elevated and set on two pairs of wheels and can then be hauled by a team.

## B-G Loaders and Conveyors

The B-G loaders and conveyors, manufactured by the Barber-Greene Co., for handling broken stone, gravel, coal and other materials are suitable for general contractors' use in many kinds of service. The loader consists of a steel bucket elevator slightly inclined from the vertical and mounted with its four-cylinder high-power Buda engine on a crawler type traction. It is provided with a platform from which the operator handles three levers, one for steering, one for the machine movements, and one for the bucket, besides a hand wheel to elevate and lower the horizontal discs at the foot of the elevator that keep the buckets constantly filled.

The buckets discharge into a spout that provides delivery at a height of 9 feet above the base of the machine. The most distinctive features of this machine are its sturdy construction, ample power, and especially the 36-inch steel discs that are driven by enclosed beveled gears and have excess capacity for cleanly picking up the loose material and feeding it continuously and automatically to the elevator buckets, thus dispensing with a large amount of hand work.



B. G. BUCKET LOADER WITH SELF-FEEDER AND CRAWLER TRACTOR

## For General Construction

### Koehring Concrete Machinery

Previous to 1919 the Koehring Machine Company had standardized the boom-and-bucket method of distributing concrete in highway construction; had developed the automatic releasing of the clutch and setting of the brake when the skip reached the proper elevation for discharging into the mixer drum; and had adopted the two-

speed forward and one-speed reverse traction, allowing a speed of approximately 1½ miles per hour for travel across country. Since then it has adapted other improvements to its mixers.

#### WATER-MEASURING TANK AND BATCH METER

All its mixers now have the automatic water-measuring tank, insuring uniform consistency in all batches. The measuring feature of this tank consists of a pipe, the end of which can be raised or lowered. This movable end is in a tank of water which automatically fills to a fixed point and when the 3-way valve is opened discharges

through this pipe, emptying the tank to the level of the adjustable end of the pipe. This end once being set, the same amount of water will be admitted to every batch.

In order to further standardize the mixing of concrete, the company developed the batch meter, which measures the amount of mixing received by each batch, locking the discharge of the mixer until the required time has elapsed and announcing the release of the discharge by the ringing of a bell. Experience shows that a mixer equipped with this instrument becomes a pace-maker for the crew and thus increases output.

#### NEW PAVERS

Two new pavers have been put on the market, No. 21E and 28E. These contain all improvements, such as the power discharge, caterpillar traction, a distributing bucket, which, opening crosswise of the road, spreads the material as the bucket is drawn toward the machine. All pavers except 28E may be equipped with a power-operated derrick for picking batch boxes from industrial cars or trucks and charging them into the skip. The derrick used on No. 21E consists of a mast moving vertically through rings on the frame and carrying a block for support at the base. A spring attached to the mast and to the top of the mixer frame holds it, when not in use, about 9 inches above the ground. The 10-foot boom swings freely. Power is obtained from a winding drum, both clutch and brake being controlled by a swing lever. When the cable picks up the batch box, the weight pulls the mast to solid bearing on the ground. The box is swung to position, emptied and swung back on to the car. As soon as the load of the box is released, the spring pulls the mast to its original position ready for the mixer to move ahead.

The larger machines have an automatic distributing bucket return so that, should the bucket strike the end of the boom, the clutch is instantly thrown out, the bucket dumps and returns to the mixer for another batch. The bucket may be stopped at any point on the boom by a level control.

The company has developed a No. 28E paver, the drum of which holds 28 cubic feet of concrete. Power is furnished for the drum by a 45

h. p. 4-cylinder gasoline engine. Instead of a charging skip, a batch hopper is useful, the boxes being picked up from the car or truck by a traction crane, elevated into position above the hopper, and dumped mechanically. Traction for the mixer is furnished by the crane.

#### MIXER LOADER

This company's mixer loader consists of a steel frame approximately 60 feet long, on which travels a belt conveyor for carrying the aggregate to the skip. This measures the materials exactly in the hoppers and charges the loading skip quickly as it reaches the ground.

The company also makes a contractors' pump for furnishing water for the mixer. This is a 4-cylinder pump equipped with a vertical boiler. It is a displacement ram pump, outside packed, and the steam governor is controlled automatically by water pressure in the line so that the pump operator has only the responsibility of firing the boiler.

## Lakewood Equipment in Concrete Construction

The dam for the Connecticut Light & Power Company, at Stevenson, Conn., is 1,200 feet long and 122 feet high, and contains 160,000 cubic yards of concrete. This was placed at the rate of 30,000 yards per month, one of the best records being 750 yards in nine hours from two one-yard mixers.

The ends of the dam were built simultaneously. The river was then diverted through the power house gates and the central sections constructed.

A Lakewood concrete plant was selected for this work because it was guaranteed to handle 4-inch aggregate. Later the size of the aggregate was increased, and in order to be prepared, a large supply of extra repair parts were kept on hand but were not used.

Two mixing plants were installed, each containing two 28-foot electrically driven Lakewood-Milwaukee mixers, which delivered to buckets in duplex hoisting towers about midway between



KOEHRING MIXER LOADER CHARGING A KOEHRING MIXER



the center and the ends of the work. The concrete for the center portion of the dam was spouted through three, and sometimes four, sections of type 0 unit plants and continuous 50-foot trussed chutes. The adjustable tower hoppers enabled the chutes to be located near the surface of the ground for concreting the foundations, and to be raised to higher elevations as the work advanced, thus eliminating unnecessary hoisting and expediting the distribution of the concrete, while always affording sufficient pitch to the chutes to enable the concrete to flow by gravity to the remote points.

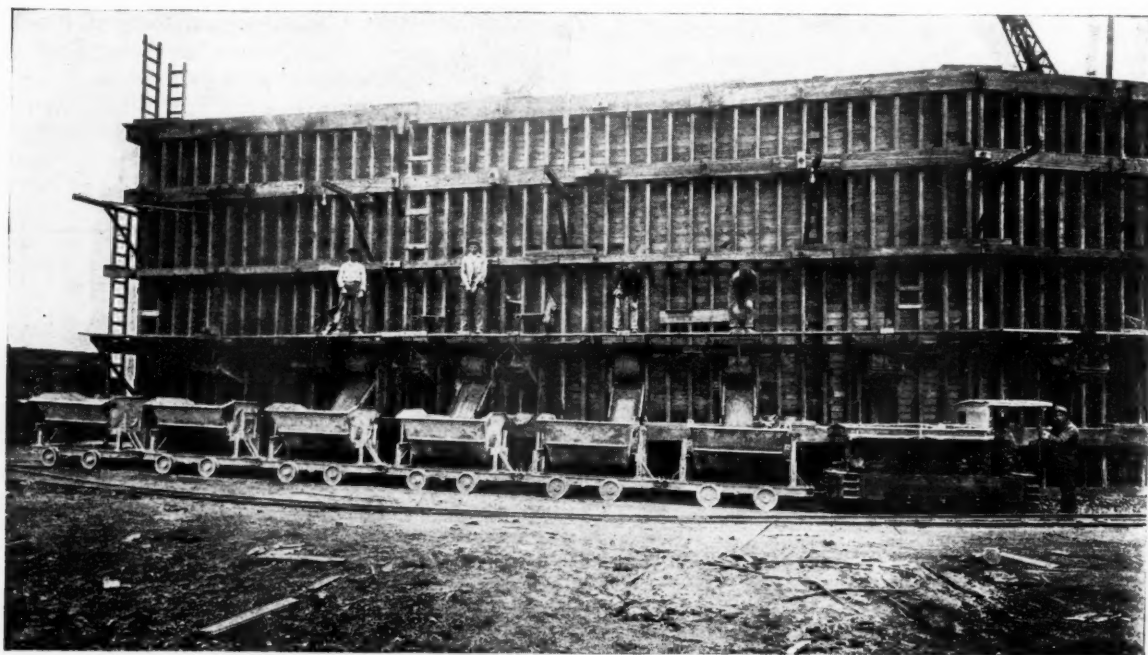
A portion of the concrete was mixed in a gravity plant spouted to a re-elevating tower through eight 50-foot sections of Lakewood chute with elbow connections, making a 400-foot line of chutes. From the re-elevating tower the concrete was spouted to the forms. Each of the two plants installed consisted of two 28-foot electrically driven Lakewood-Milwaukee mixers. The tower and chuting plant used included Lakewood hoppers with sliding frames, tower sheaves, buckets, bin gates and about 1-3 mile of cable-supported chute and unit chute plants. Stones up to 12x8x6 inches and weighing 30 pounds, were safely handled through the chutes and the Lakewood elbow connections, the open inside construction of which offered no obstruction to the concrete at the junctions of the chute sections. The flat chute braces commonly used were, however, replaced by arched chute braces, enabling run-of-bank gravel to be used for aggregate and eliminating the elaborate elevating tower screening, conveying and storage plants that would otherwise have been necessary. The work was executed by the J. A. P. Crisfield Construction Co., Philadelphia, and C. W. Blakeslee & Sons, New Haven.

## Ransome Concrete Machinery

The Ransome Concrete Machinery Company manufactures practically all appliances used in concrete construction, including building, paving and pneumatic mixers and chuting equipment. Their latest small mixer is the improved Bantam No. 7-S. The most noticeable improvements made in this are as follows:

### BANTAM MIXER

Front and rear wheels have the same tread instead of being narrower in front than in the rear; frame all steel instead of wood; width of rollers and traction rings increased from 1½ to 2 inches, diameter of rollers from 7 to 10 inches, and hubs from 4 to 8 inches; driving chain has 65 per cent more strength; a universal overhead frame has been adopted, making all charging mechanisms interchangeable. Motor power changed from 3 h. p. to 4 h. p. The compensating sheaves taking the cables from the power loader skip have been changed to grooved conical winding drums, giving a more positive action and saving wear on cables. All power loaders are equipped with an automatic knockout which throws on the brake when the skip reaches its highest position. Builders' hoists may be furnished on 7-S Bantams driven by gasoline engines, the hoist having a capacity of 750 pounds on a single line at 120 feet per minute, or, by using a double line, a hoist bucket with a full batch can be lifted 160 feet per minute. It is claimed that the driest mix is discharged rapidly from the drum, which is particularly advantageous in curb and gutter work where forms are

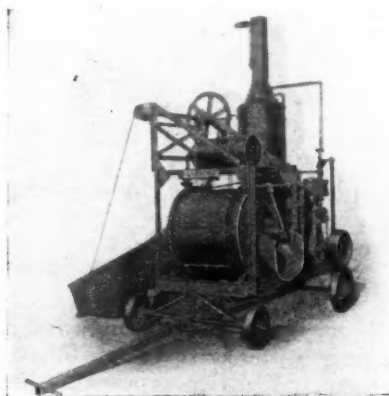


V-DUMPAGE CARS AT UNITED DRUG COMPANY'S BUILDING, ST. LOUIS, BEING LOADED WITH SAND DELIVERED THROUGH LAKEWOOD BIN GATES

removed as soon as the concrete has been discharged.

#### BUILDING MIXER

The standard building mixer, 1920 model, has axles built up of two 6-inch channels; front wheels 24x8 inches, rear wheels 36x8 inches; the large diameters and wide tires facilitating the handling of the mixers on difficult roads. The main frames are all channels, with six cross members and the rear half of the frame covered by a large steel squaring plate which stiffens the frame. All frames are standard built and will take steam, gasoline or electric power without any alteration. The mixing action of the 1920 model is exactly the same as that invented by the



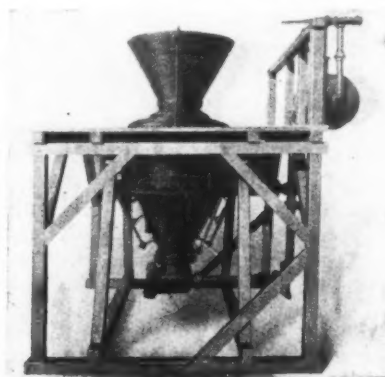
STANDARD BUILDING MIXER

late E. L. Ransome, which he described as "a grinding, rubbing contact and forceable kneading of the materials into a homogeneous body." In the 1920 model, both sides of the drum pinion, which is of semi-steel, have been shrouded, increasing the strength almost 50 per cent and making it practically impossible to strip a tooth. The discharge mechanism has been completely redesigned and a splash plate provided to prevent slopping. The charging chute has a circular outlet the full diameter of the opening in the drum, permitting quick charging. The outlet into the drum is closed by means of a vertical sliding gate entirely outside of the hopper. The skip has the same general shape as before. The skip hoist drum clutch, sometimes called a hoist crab, is mounted on the countershaft instead of as a separate attachment on the side of the mixer frame as formerly and is of the contracting band type, self-locking and not requiring the operator to maintain pressure on the hoist lever during hoisting. In place of winding spools with a narrow, deep groove, the 1920 standard is equipped with a conical-shaped drum on which the rope winds into a separate groove for each turn, thus affording maximum power when the skip begins to lift and maximum speed as the materials slide into the drum. Water piping, instead of passing to the drum through the batch hopper and out through an opening in the gate, in the 1920 model runs between the side of the batch hopper and the mixing drum, keeping the piping entirely outside of the batch hopper and thus eliminating any interference by the water pipe with the materials passing from the hopper into the drum.

These mixers are made in four sizes, known as the 4-S, 21-S, 28-S and 56-S. The two latter are furnished only on skids, the other two on either skids or trucks as desired. 28-S and 56-S are not furnished with gasoline motors but 14-S and 21-S may be equipped with steam, gasoline, electric or belt drive.

#### PNEUMATIC MIXERS

Ransome-Canniff pneumatic concrete mixers and grout mixers are claimed to be practically the only type adapted to tunnel work and jobs where absolutely water-tight work is required. The grout mixer will average forty batches an hour, working against heads up to 175 feet. Cost sheets on tunnel lining work have shown that



PNEUMATIC CONCRETE MIXER AND PLACER

these mixers will mix and place concrete at approximately 40 per cent of the cost of mechanical mixing and placing by hand. It handles a batch of 14 cubic feet of loose aggregate or 10 cubic feet of mixed concrete. It will successfully convey one-half a mile, although shorter distances are the rule. Up to 500 feet it will average 50 batches an hour under ordinary conditions.

#### PAVING MIXERS

The 1920 model of paving mixers, the 21-E paver, closely parallels the 1920 building mixer in design and construction. The power loader skip is extra light and can be used as either a closed or open-end skip. All mechanisms except the transmission are mounted on one shaft. The drum pinion has a jaw clutch, permitting the drum to be thrown out of gear on long travels. Either road wheels or crawling traction may be used, the latter of the type used on Marion steam shovels, extending the full length of the machine without break. Simple, leather-lined friction clutches, driven by chains direct from the countershaft, handle the bucket on the boom, making it particularly smooth running. The bucket is of the boom dumping type. This model can be very easily dismantled for railroad shipment and erected on the job, requiring only two men with wrenches. When ready for shipment its maximum height is 11 feet, thus clearing all standard bridges or tunnels.

#### CHUTING EQUIPMENT

The Ransome chuting plants include both a boom plant, either stationary or portable, and a continuous line plant. The 1920 hopper heads have been increased 25 per cent in depth to take

care of the checking of the return of flow caused by the change of direction at the hopper head, which would otherwise permit the concrete to pile up until the original velocity was again acquired. The chutes are standardized and completely interchangeable, and built on a system of unit construction. The steel towers are built in 15-foot lengths, which has been found most economical for shipping, assembling and dismantling.

#### PORTABLE WOOD-WORKING MILLS

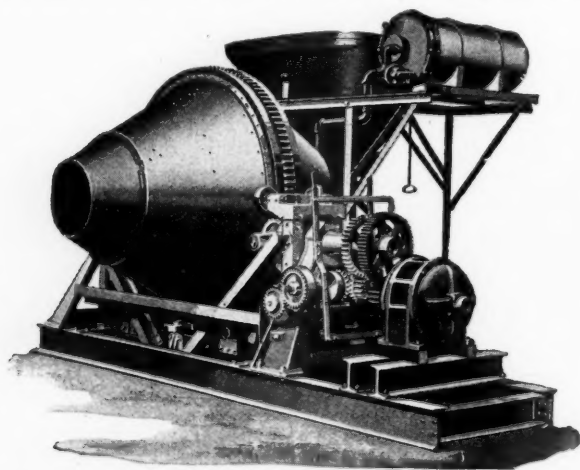
This firm also makes a portable wood-working mill, built all of steel. Three and 6 h. p., type Z Fairbanks-Morse engines are used, fitted with Bosch magnetos, designed for use of kerosene. When desired, 3 h. p. or 5 h. p. electric motors are furnished; or the mill may be driven from a line shaft or an independent motor. Fourteen-inch rip and crosscut saws are regularly furnished with the 3 h. p. outfits and 16-inch with the 6 h. p. gasoline or 5 h. p. motor outfits. Each outfit includes ripping gauges, crosscut gauges, a 6¼-inch jointer for planing, a boring attachment and a 10-inch disc sander. In addition an emery wheel, mortising attachment, molding attachment, band saw attachment, dado head, jig saw, and wood lathe attachment may be used.

## Smith Pumps, Excavator and Concrete Mixer

#### MIXERS

The Smith non-tilting mixer is made with capacity for 4, 7, 14, 21 and 28 cubic feet of mixed material. Sizes above 4-S can be furnished on trucks or on steel skids, and can be equipped with power loader, batch hopper or standard with either steam, gasoline or electric power. Smith patented central drum ring increases the life of the mixer by insuring even wear on the rollers, bearings and roller tracks, and their center location prevents them from coming in contact with falling dirt and concrete.

The 4-S mixer, non-tilting type, handles 4 cubic feet of wet or 6 cubic feet of loose material. Can



TILTING MIXER WITH BATCH HOPPER AND ELECTRIC MOTOR

be equipped with gasoline or electric power and with power loader, batch hopper or with a low charging platform only 18 inches from ground. Entire capacity of the drum discharged in 8 seconds.

The tilting mixer discharges the entire contents of the drum at one time by tilting the drum while it is revolving. Made with capacity for 10, 14, 21, 28 and 56 cubic feet of mixed material. On steel skids or on trucks. Can be loaded by either standard feed spout, gated batch hopper or power loader. Power furnished by either gas engine, electric motor or steam engine. Easily the fastest discharging type of mixer ever designed.

Smith Simplex paving mixers are made in three sizes having capacities of 10, 14 and 21 cubic feet of mixed material. Interchangeable with boom-and-bucket or chute delivery. Traction is interchangeable with either the wheel or caterpillar type. Either of these changes can be made quickly and easily—right on the job if necessary. High drum design gives the boom a clearance of 7 feet from the ground, permitting workmen to pass below it and making possible a deep narrow bucket which will handle even the dryest mixtures without overloading. Gasoline or steam power. Holds world's records for production.

#### PUMPS

Smith high-pressure force pumps are made in sizes ranging in capacity from 700 to 3,500 gallons per hour and in two types, the double-action force and the outside packed plunger. Cylinder is cast integral with jack bearings, insuring perfect alignment at all times. On skids or on trucks.

Smith centrifugal pumps have capacities ranging from 7,200 to 28,500 gallons per hour. Every part of the pump is built to jig and limit gauge. Repair parts are quickly installed, with perfect assurance of an absolute fit.

Smith diaphragm pumps are made in capacities of from 4,000 to 19,000 gallons per hour. Three styles—single diaphragm “anti-splash,” double diaphragm “anti-splash,” and “odorless” single diaphragm. “Odorless” pump will operate against a friction head of up to 30 feet and is completely inclosed so that the odor from materials being pumped is retained within the pump. Mounted on steel skids or trucks.

#### EXCAVATOR AND LOADER

The Smith excavator and loader is a portable drag-line which both digs and loads. The digging slip operates on a cable drawing the material up to the machine. It is then lifted up over the machine and emptied into the awaiting trucks or wagons. Requires but two men to operate and has a capacity of from 150 to 350 cubic yards of material per 8-hour day. Excavates within radius of 200 feet of machine. Machine itself works at loading level; does not get into the excavation; is easily moved from one job to another.

#### The Easy Double Claw Bar

This tool, made by the Easy Mfg. Company and sold by hardware dealers generally, is 27 inches long, weighs 4 pounds, and is very efficient for general wrecking work. At one end it is slightly bent and flattened to a chisel edge for use as a



pinch bar. At the other end there is an oblique T-head with double claw so that it can be either pushed or pulled and will reach work not accessible by an ordinary claw. It will hold a nail



without a head, will pry off boards without splitting them and is a very handy wire stretcher and fence tool.

## The Largest Stone Crusher

The Traylor Engineering & Mfg. Company claims the distinction of having built and erected the largest stone crusher in the world, an enormous machine about 25 feet high from foundation to top. It weighs over 800,000 pounds and was completed in ninety working days, the erection requiring only fourteen days from freight car to breaking stone. This machine was installed more than a year ago at the largest limestone quarry in Michigan in order to eliminate labor in handling stone and thus cut down the amount of block holing and quarry work. It has a capacity for receiving rocks with dimensions of 5 feet in any direction, some of which weigh as much as 15 tons each. These are broken to 8-inch size

at the rate of more than 40,000 tons per 20-hour day, which has been averaged since the machine was installed.

This machine is of the standard bulldog gyratory type, and in order to limit the bearing pressure to safe amounts, it has an eccentric more than 8 feet long and 45 inches in diameter, with 9,900 square inches of bearing surface, fitted with a self-aligning journal bearing that absolutely prevents binding and reduces the friction.

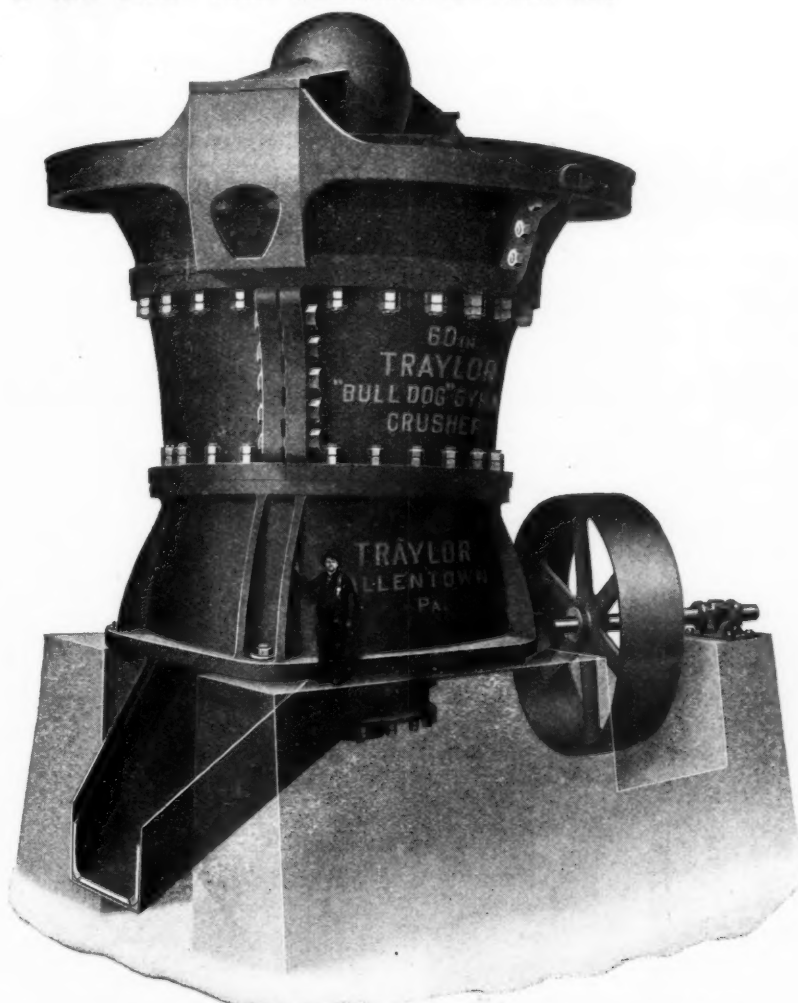
It is lubricated by a fully submerged gear type pump which provides circulation for the continual bath of oil in which all the moving parts, including the cut steel gears, run. The main shaft is shorter and very much stronger than in other makes of gyratory crushers, resulting in a high percentage of power efficiency and smaller amount of power consumption per ton of material crushed.

The builders of the bulldog gyratory crushers also manufacture a complete line of "Bulldog" jaw crushers, crushing rolls, revolving screens, rod, ball and tube mills, stone elevators and other quarry, mine and smelting equipment.

## "Ever-Clean Gravel Screen"

The Ever-Clean gravel screen made by the Beach Mfg. Co. is especially recommended as being constantly and automatically maintained clean, thus preventing clogging with wet material and fine pebbles that greatly reduce the capacity of a sand screen. It is also adjustable to permit the grading of the gravel, from which any required percentage of sand may be removed.

A light collapsible steel framework supports the inclined flat screen which operates like an endless belt, and is composed of short transverse sections pivoted at their upper edges to a pair of sprocket chains so that as they reverse at the upper end of the incline they strike a spring buffer and are cleaned, returning on the under side of the incline, hanging vertically until they reach the lower end when they reverse and form a continuous overlapping series moving upwards to the top and so on, traveling against the flow of sand and gravel which descends by gravity in a layer never more than  $\frac{1}{2}$  inch thick as compared with the 8 or 10-inch depth in a rotary screen.



GYRATORY CRUSHER WITH CAPACITY FOR 40,000 TONS PER DAY OF 5-FOOT ROCKS

The unscreened gravel is elevated in the 8x10-inch buckets over an inclined conveyor which discharges into a perforated revolving cylinder which rejects the oversize stones and delivers the remainder to the inclined screen.

The screen, cylinder and conveyor are operated by an 8-h. p. gas or kerosene engine enclosed in a steel-lined room under the storage bin.

In service, the screening apparatus is mounted on top of the storage bin but can be collapsed and lowered, and the storage bin is mounted on trucks or wheels for its easy transfer to another site, which can be accomplished and the apparatus set up ready for operation in 20 minutes, thus making it easy and economical to keep the screen close to the bank.

## Sullivan Drills

Sullivan Rotator drills, manufactured by the Sullivan Machinery Company, are an improved type of hammer machine used for a large variety of rock work, such as block holing, cutting ditches, shaft sinking, drifting, stoping, light tunneling, quarry work, road grading, trench and open ditch work and down-hole drilling.

The Rotator is a one-man drill, weighing 29 to 40 pounds, drilling holes from 8 to 12 feet deep for 1¼-inch powder, and may be used as a hand tool or on a mounting.

It is made in seven separate classes, viz., hollow piston Rotator, solid piston Rotator, air tube Rotator, water tube Rotator, steam tube Rotator, auger Rotator and light Rotator, all of which may be used with cradle and feed screw mounting or with pneumatic air feed.

The steam tube Rotator is similar to the air tube drill but uses steam instead of air.

The drills have automatic lubrication, the oil

being distributed as a spray over the working parts. The handle is arranged with either a double grip for hand feeding, or with a single grip when mounted.

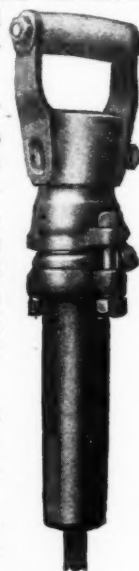
The new auger Rotator, class DR-37, has been developed for drilling in soft, broken or loose ground where the ordinary compressed-air hammer drill strikes too hard a blow. It weighs 35½ pounds and is only 18 inches long.

The new light-weight Rotator, DP-32, is designed especially for work in which it is customary to hold the drill by hand, even when above the horizontal. It has a high drilling speed, excellent running balance and very little vibration. It uses 7/8-inch hollow hexagon steel and will drill 4-foot holes under average conditions.

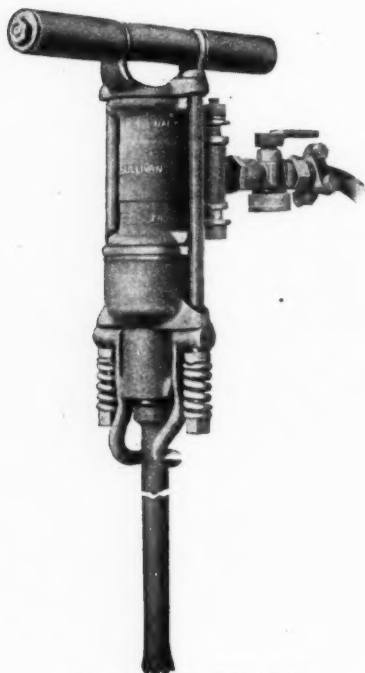
Another new Sullivan hammer drill is the plug drill, DH-3. This is recommended especially for granite drilling. Speed, light weight, reduced vibration and small air consumption and repairs are among the advantages claimed for it. It is 18 inches long, weighs 20 pounds, uses 7-16-inch air hose, is rotated by hand and the holes are cleaned by a blower hose.

The efficiencies of these machines are demonstrated by letters from users, who report some notable records. Repairs were at the rate of \$0.015 per lineal foot drilled for Rotators working in hard rock at the Utah Silver-Lead Mines.

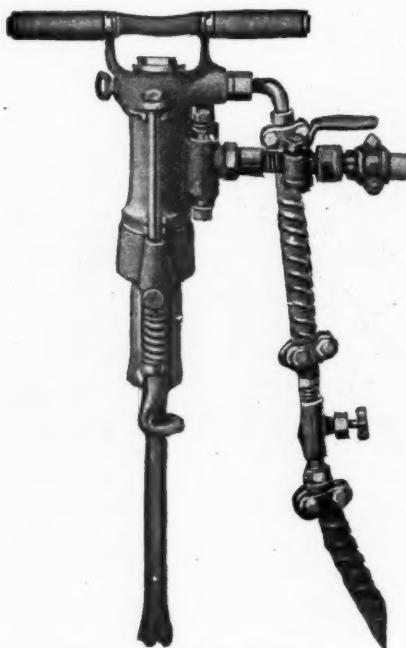
One DP-33 water drill on cradle mounting drove 175 feet of 5x7-foot heading in very hard diorite for Sullivan, McQuarrie & Clark, contractors, on the So. Pacific Gold & Copper



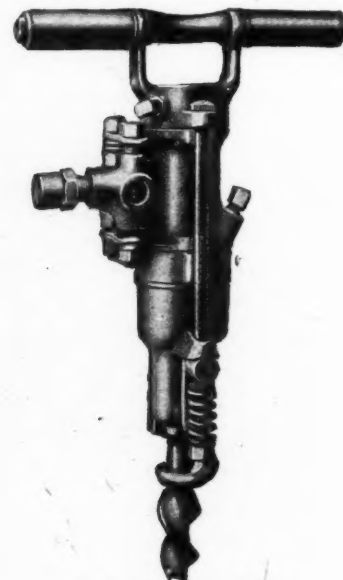
DH-3 PLUG DRILL



DP-32 LIGHT ROTATOR



WATER TUBE ROTATOR



DR-37 AUGER DRILL

Co.'s adit, north of Ogden, Utah, without being taken out of the heading during the entire distance and was never taken apart.

At a well-known Arizona copper mine, Rotators have cost \$6.53 per quarter year per drill for repairs, based on 67,000 drill days of use. Based on 6,000 drill days during the last quarter, the cost has been \$1.28 per drill.

Sullivan Diamond drills for taking test cores have a capacity of 300 to 7,000 feet and are available for operation by hand, horsepower, belt, compressed air, steam, electricity, gasoline or oil engines. They secure cores of 15-16 to 2 inches diameter from any kind of rock formation.

For the preliminary exploration of the site of the dam at Widow's Bar on the Tennessee River, 47 test holes in water 6 to 8 feet deep were drilled to a depth of 18 feet in the solid limestone by a Sullivan Bravo drill operated by a gasoline engine and removing core 15-16 inches in diameter that demonstrated the soundness of the rock.

## Blasting Appliances

The Davis No. 1 blaster, manufactured by the Atlas Powder Company, weighs  $3\frac{1}{4}$  pounds and develops ample current to fire five 30-foot copper wire electric blasting caps, or five 6-foot iron wire electric blasting caps, connected in single series. The outer case is a seamless brass tube, heavily nicked, the top and bottom plates are aluminum. It has binding posts to which the leading wires are connected. To fire the blast the machine is held in the left hand; the key, held in the right

hand, is inserted in the bottom slot and given a hard turn to the right.

The Atlas moisture-proof blasting cap carrying case is the only device of the kind which makes suitable provision for a day's supply of blasting caps. It is made of aluminum, is  $\frac{7}{8}$  inch in diameter and  $2\frac{1}{8}$  inches long, holding seven No. 6 or 8 blasting caps. It has a telescopic lid protected by a rubber sleeve covering the joint and making it moisture-proof. It is easily carried in the pocket, insures the proper condition of the caps and prevents any danger in handling them. The carrying case and the Davis blaster are both handled by the Atlas Powder Company.

## Williams' "Falcon" Chain Wrench

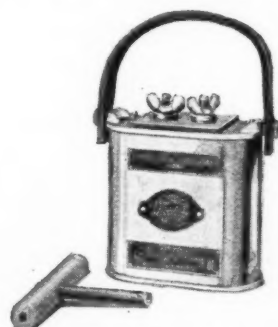
The single jaw and interchangeable flat link or cable chain wrenches for holding pipe and fittings of from  $\frac{1}{8}$ -inch to 12-inch diameter are put on the market by J. H. Williams & Co. They are new tools valuable for pipe work on many kinds of construction operations or in machine or repair shops. The removable jaw is reversible, end for end, so that all of the teeth may be equally worn, after which they may be file sharpened. All parts are interchangeable and replacements are carried in stock. The wrenches are from 20 to  $64\frac{1}{2}$  inches long, weighing from  $5\frac{3}{4}$  to 50 pounds each. The flat link chains have breaking strengths of 6,700 to 21,800 pounds.

## A New "Jackhamer"

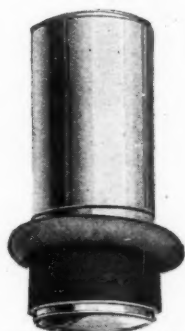
Another Jackhamer known as the DCR-13 has just been brought out by the Ingersoll-Rand Company. This completes the family of Jackhamers manufactured by this company. The others are the BAR-33, 21 lb.; the BBR-13, 36 lb.; the BCR-340, 41 lb., and the DDR-13, 70 lb. Altogether there are five sizes and thirteen types. This company now claims to have a Jackhamer available for every hand-hammer rock drilling job.

The new Jackhamer weighs 55 lb. It is rated to drill holes up to 12 feet deep rapidly in hard rock and it will fill all the requirements of a medium-weight sinker or down-hole drill. Hence it will be welcomed for shaft sinking, quarrying, road building, prospecting, developing, etc. It is extremely simple and sturdy, so it will easily withstand the most severe uses encountered in the class of work for which it is designed.

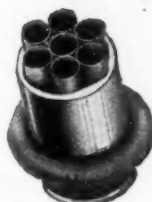
The features most worthy of note are: All-steel construction, steel drop forgings or bar stock being used exclusively and specially heat treated. All bolted construction, nothing to work loose and easy of access. Automatic rotation, very powerful, relieving the operator of this fatiguing part of the work. Spring-retained front-head, takes up shocks that would otherwise fall



NO. 1 BLASTER



CARRYING CASE CLOSED



CARRYING CASE OPENED



on the machine. Spool butterfly valve, operating on the well known "butterfly" principle. Handy hole-blowing device, very effective in keeping the drill hole clear. Renewable bushing in rotation sleeve. Automatic heartbeat oiler and grease pockets in handle and front head assure continuous satisfactory lubrication.

These drills are furnished for drilling dry holes (DCR-13) and wet holes (DCR W-13). Although they are usually used unmounted as sinkers, they may also be supplied with the JC-11 mounting for development or light drifting work.

## Yale Chain Hoists

The line of hoists manufactured and sold by the Yale & Town Company provides a portable, spur-gear, screw-gear, or differential-chain block and electric hoist for almost every purpose requiring a light, easily handled and operated device for lifting weights to a moderate height. When operated by a single man exercising an 80-pound pull on the hand chain, these three types respectively hoist an 800-pound, a 1,700-pound, or a 2,000-pound weight 18 inches, 12 inches or 24 inches in  $\frac{1}{2}$  minute, using a 1-ton differential, screw-gear, or spur-gear block.

The spur-gear chain block is so constructed, and the pressure of the gears is so balanced, that the load is distributed equally on every tooth of every gear and on both bearings, reducing wear to a minimum. It is the safest and speediest portable hand hoist where loads must be lifted frequently by expensive labor. It holds the load and will not lower it until the hand chain is pulled. It is made in 17 sizes with capacities of 500 pounds to 40 tons.

The Yale differential chain block is adapted to occasional services for comparatively light loads and requires a hand chain pull  $2\frac{1}{2}$  times as great as that for the spur-gear block. It has the fewest parts and great reliability and simplicity. It is made in six sizes with capacities of 500 pounds to 6,000 pounds.

Yale electric wire rope hoists are in a class midway between chain blocks and heavy-duty traveling crane and give from 5 to 10 times the speed of hand hoists. They are made with capacities of 1, 2, 4, 5, 6 and 10 tons for use with direct or alternating current.

The same company also produces electrically operated chain hoists which can be safely used with unskilled labor at a speed from 5 to 10 times as great as that of hand hoists for loads of 50 to 4,000 pounds.

The steel chains used in these machines are die forged for maximum accuracy and durability, and are electrically welded on the side, securing a joint that is claimed to have 100 per cent strength so that a  $\frac{1}{2}$ -inch Yale steel chain has an ultimate strength of more than 22,000 pounds. The chains are equipped with steel safety hooks so designed that with heavy overloads they will open slowly without fracture.

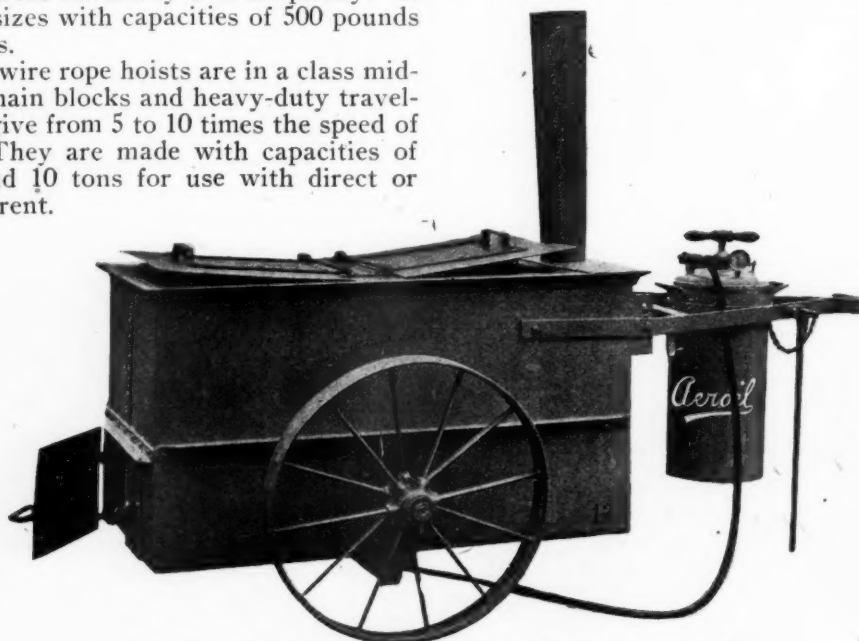
## Gasoline Driven Diaphragm Pumps

The gasoline driven diaphragm pump outfits made by the Edson Mfg. Company are adapted for use on sewer and construction work. The pumps are driven by air cooled gasoline engines which are competent to exert a force of 1,000 pounds per stroke and are guaranteed to drive the No. 3 (3-inch) diaphragm pump at full capacity for a fuel cost of 2 to 5 cents per hour. The outfit can be easily transported by two men. All the gears are enclosed in the crank case and run in oil. The weight of the engine and pump mounted on skids is 390 pounds; mounted on trucks, 565 pounds.

## Aeroil Kerosene Burners

The Aeroil kerosene burners, made by the Aeroil Burner Company, are recommended to produce smokeless fires for melting tar, pitch, asphalt, varnish and rock asphalt mastic. They do not produce sparks, smoke or ashes and are adapted for outdoor use, where the flame cannot be extinguished by wind, rain or snow.

They are constructed for rough usage and, being free from delicate or complicated parts, will last a lifetime. Economy of time and labor is ef-



AEROIL BURNER ATTACHED TO A WHEELED KETTLE

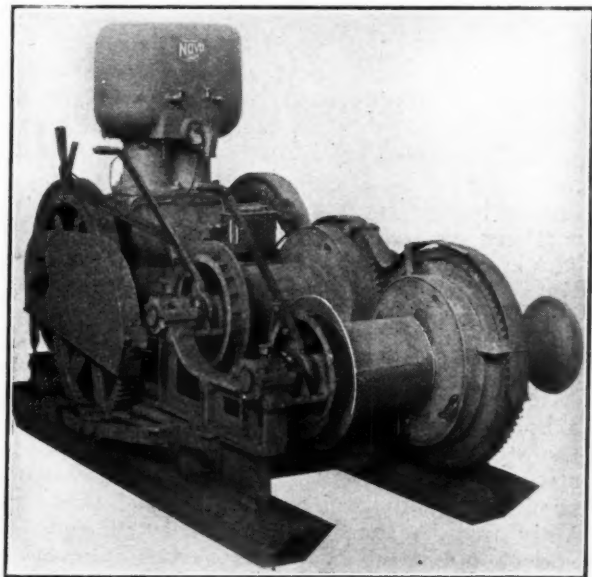
fectured by the use of coal oil, which eliminates the trouble and delay of cutting and hauling wood for fuel. They are made in three sizes with capacities to melt 1 barrel of asphalt in 40 minutes, 2 barrels of asphalt in 50 minutes or 3 barrels of asphalt in 70 minutes. The No. 3 burner melts and cooks 1,200 pounds of rock asphalt mastic in 2½ hours, using 8 gallons of kerosene.

## Novo Air Compressors Pumps and Hoists

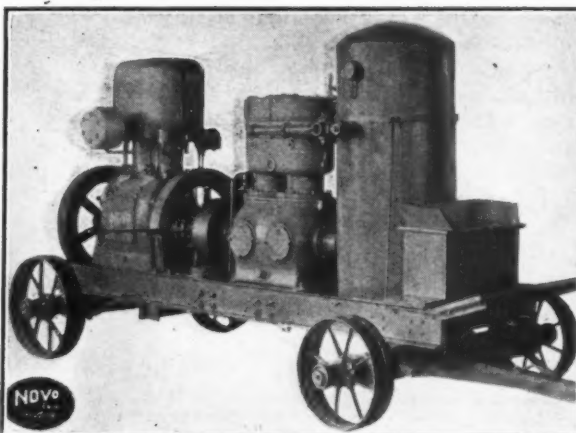
The portable air compressor manufactured by the Novo Engine Company is a 6x6-inch duplex machine with-piston displacement of 80 cubic feet of free air per minute at 100 pounds pressure. It is operated by a 15 h. p. Novo gasoline engine which may be mounted with it on a truck, keeping the center of gravity at a low elevation and enabling the operator to start the engine from the ground. The engine and compressor are connected by a special friction clutch coupling that permits the engine to start without load and have the compressor thrown on after full speed has been attained. The compressors are suited to operate stone cutting tools, rock drills, paint sprayers, concrete surfacing tools, caulking tools, wood or metal boring machines and pneumatic riveters.

The Novo DH hoist is a very compact and durable machine built with ample factors of safety, strength and durability for constant hard usage. It is designed to be controlled from positions where the operator commands a full view of the hoist and load and is fitted with powerful brakes to assure the greatest safety in hoisting and maintaining the load.

It has a capacity for hoisting 3,000 pounds 120 feet per minute or 1,400 pounds 280 feet per minute and can be made reversible or single speed as desired.



TWO-DRUM HOISTING ENGINE ON SKIDS



PORTABLE AIR COMPRESSOR, GASOLINE ENGINE AND RECEIVER

The smaller type T hoist can be mounted on steel trucks for portable work and is made with a two-speed sheave, which can be operated entirely independent of the drum if desired. It is made in 6, 8 and 10-h. p. sizes, geared either 9-1 or 12-1, as required. These different sizes and gears give it a range of from 1,000 pounds hoisted 150 feet per minute to 2,800 pounds hoisted 100 feet per minute, thus affording considerable range and variety for light work.

The Novo Company also manufactures a duplex pump operated by the Novo engine and mounted with it on a rigid base that is capable of delivering water through several miles of pipe line. The 6-h. p. size will deliver 14,000 gallons per day and the 10-h. p. size will deliver 18,000 gallons per day.

The same company also manufactures portable diaphragm pumps and centrifugal pumps driven by their standard engines and having capacities for raising up to 12,000 gallons per hour for low heads.

## "Dumps Right" Cars

The "Dumps Right" cars, manufactured by the Automatic Dump Car Company, have an all-metal body, cut-steel gears, bronze and steel bearings, pressed steel frames, and are made in sizes of 1½, 2 and 3 yards, weighing, respectively, 1,400, 1,550 and 1,650 pounds.

The dump body is made of 11-gauge, hot-rolled steel with smooth welded seams, and glides easily to side dumping position without cables or chains, being actuated by positive members that are entirely reliable and will dump the load with ease and accuracy two feet away from the truck wheels and return to original position in 1½ minutes.

The body is perfectly smooth inside, enabling it to be washed clean with a hose. Hot asphaltum will discharge as easily and leave the body as clean as will dry, clean sand.

Trucks equipped with these dump bodies have considerable advantage in being able to deposit the load without turning around or backing, as is required for end dumps. They are used by the

Gross Nickle Construction Company for hauling asphaltum, which is dumped on the side of the street without the trucks running over the new or unfinished pavement, which might damage the base; a fact which is considered of importance by the above contractors, who also state that the dumping is done easily and more quickly than that of many other dump trucks they have seen.

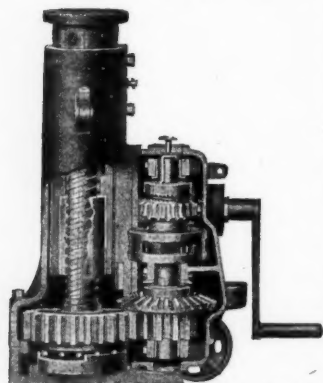
with absolute safety at any point desired. The action is positive, so there is no possibility of sticking.

This jack is made by the Duff Manufacturing Co. in two capacities, 50 and 75 tons maximum. Both the 50 and the 75-ton jacks are supplied in a variety of heights to suit any requirements.

## A New High-Speed Ball-Bearing Screw Jack

Many novel features of construction are embodied in the latest design of Duff high-speed ball-bearing screw jack, a tool which is particularly adapted for bridge work and other purposes where a lifting capacity of 50 and 75 tons is required.

The most noticeable thing that distinguishes it from previous designs of screw jacks is the fact that the operating mechanism, instead of being located in the head, is placed in the base. The greater weight is thus put at the bottom instead of at the top, so that the jack is not top-heavy.



DUFF HIGH-SPEED BALL-BEARING SCREW JACK

Another advantage is that the point at which the operating level is pivoted does not rise with the load. This allows a full, powerful stroke, regardless of the height of the load.

This newly designed jack is unusually easy to move about. Not only does the concentration of weight in the base make it easy to handle, but by inserting the operating lever in special sockets, the jack can be tipped over by one man and rolled on its own sturdy wheels wherever needed.

The load is raised by means of a 6-foot steel lever which operates a double-thread screw through a ratchet and gearing. The screw has a very steep pitch, making the action extremely rapid. The screw is made of special machinery steel, heat treated, and turns in a bronze nut of special composition. This combination of bronze and hard steel materially reduces friction.

Absolute safety is assured by a positive clutch which holds the load at all times, preventing any possibility of it sinking or lowering. The fact that the holding clutch does not permit any appreciable sink-back assists in making every ounce of pressure applied to the elevating lever count. Another safety feature is the signal which is provided to indicate when the jack has reached its maximum height.

For lowering, a crank handle is used. A few easy turns are all that are required, as the action is very rapid. Regardless of the speed with which the load may be descending, it may be stopped

## Red Edge Shovels

The Wyoming Shovel Works issue a number of pamphlets descriptive of "Red Edge" shovels, scoops and spades, emphasizing the importance of correct design. One of these booklets, called "Scientific Shoveling," contains an excerpt of Frederick W. Taylor's book on "The Principles of Scientific Management." Mr. Taylor conducted a test at the plant of the Bethlehem Steel Company and found that a man could do his biggest day's work with a shovel load averaging 21 lb. As the result of proper training and correctly designed shovels, the cost of handling was decreased from \$.072 per ton to \$.033.

This pamphlet also contains some practical rules in shoveling, some of which are as follows:

1. The loads should never be thrown more than 12 feet horizontally and 8 feet vertically with long handle shovels, nor more than 10 feet horizontally and 6 feet vertically with short handle shovels.
2. Men should never carry shovel loads. The shovels should be used only for digging, casting or spreading. One step should be the limit while shoveling.
3. The men should be kept in small gangs but never worked alone. Two men together will shovel twice as much as two men working alone.
4. Long handle shovels are best for casting and loading, short handle shovels are best for unloading or digging where the stroke is downwards.
5. It is important to select the proper pattern of shovels.
6. In digging into a stock pile where material is not more than 36 inches high, a man will average 20 shovel loads per minute; if casting earth not more than 10 feet he will average 18.
7. Shoveling into a wheelbarrow or low cart reduces the average to 13, and each 6 inches additional height of car reduces the average 2 per minute. About the same ratio exists for horizontal distances.

Wyoming Red Edge shovels are made of chrome nickel alloy steel, rolled in the company's own rolling mill. The blades are heat treated throughout, making them as hard as tool steel and as tough as spring steel. To these blades are attached handles of selected XX second-growth northern white ash, made in the company's own handle plant. These shovels are made in a complete line of plain back, hollow back and back strap patterns, and a variety of handles, both the long, wooden D, malleable D and malleable Dirigo. Every shovel is subjected to several tests. After being heat treated the blades are tested in a Brinell machine which records the hardness of the steel. The handles are tested to a bending stress of 200 lb. and the finished shovel when assembled is subjected to a rough and ready test. Only then is the Red Edge painted upon this shovel, indicating that it is perfect in every respect and that it is fully guaranteed by the Wyoming Shovel Works.